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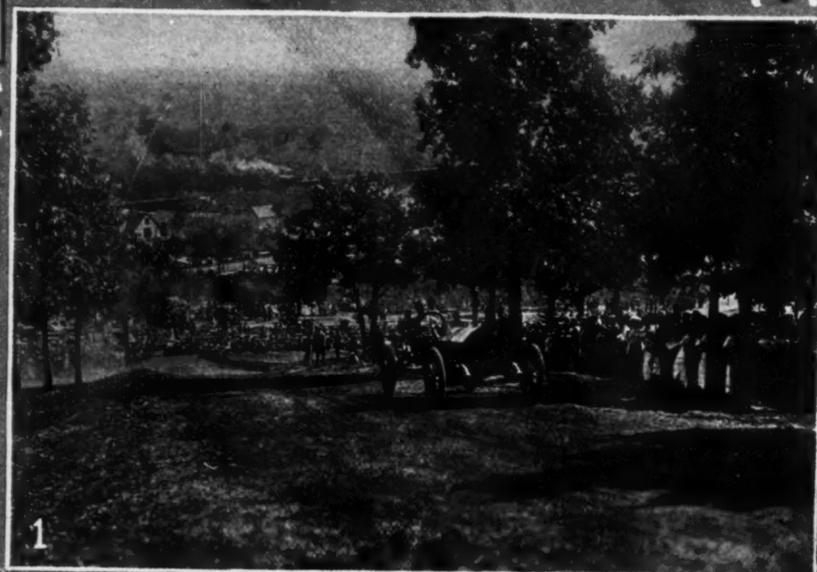
THE AUTOMOBILE

ALGONQUIN HILL CLIMB

CHICAGO, Sept. 17—At the fifth annual hill-climb of the Chicago Motor Club at Algonquin, Ill., yesterday, no very sensational time was made. The conditions were unlike any other climb in the country in that two hills were used, the total time on the two grades deciding the winners. One of these hills was a new grade that was specially built, and it was so extraordinarily steep, averaging 12 per cent., with 26 per cent. at its steepest part, that it was necessary to change the usual order and make this one a flying start climb and turn Phillips Hill into a standing start effort.

Despite these conditions the Algonquin cup, a trophy which goes to the car making the fastest total time of the day regardless of class, went to the National, Arthur

Greiner driver, with an average of 42 miles an hour for the two hills. On the new hill, the National went up to 38.8 miles an hour to the 1,000 feet, while on the half-mile Phillips Hill its time was :39 4-5. A 45-horsepower Benz, driven by Hearne, climbed Algonquin Hill fastest, its :17 2-5 being a shade better than the National's :17 4-5. On Phillips Hill, though, the National did :39 4-5 twice.


1


4


2


3

Fig. 1—One of the Kisselkars starting up the stiff grade
Fig. 2—Contestants lined up ready for the start
Fig. 3—Moline, No. 8, performed well in its class
Fig. 4—Ford, No. 6, won in Class A, Division 2A

No. Car	Driver	A. M. Time	P. M. Time	Total Time
Class A, Division 1A—$800 and Under—				
1—Brush	Lincoln	1:17	1:46	3:03
Class A, Division 2A—$801 to $1,200—				
6—Ford	Rice	:27 4-5	:53 4-5	1:21 3-5
5—Ford	Gruener	:31	:55 1-5	1:26 1-5
3—Cartercar	Pendleton	:32	1:00 4-5	1:32 4-5
2—Oakland	Harding	:35 4-5	1:00	1:35 4-5
Class A, Division 3A—$1,201 to $1,600—				
7—Parry	Dull	:24 4-5	:50 4-5	1:15 3-5
8—Moline	Salisbury	:26	:57 4-5	1:23 4-5
10—Staver	Monckmeier	:31	1:06 2-5	1:37 2-5
Class A, Division 4A—$1,601 to $2,000—				
12—Jackson	Hearne	:24	:46	1:10
11—Velie	Cooney	:23 2-5	:49 2-5	1:12 4-5
16—Kisselkar	Branstetter	:28 3-5	:54	1:23 3-5
14—Inter-State	Seek	:29 3-5	:55 1-5	1:24 4-5
Class A, Division 5A—$2,001 to $3,000—				
17—National	Seek	:19	:46	1:05
Class B, Division 2B—161 to 230 cubic inches—				
18—Velie	Stickney	:23 1-5	:46 1-5	1:09 2-5
20—Staver	Monckmeier	:22 4-5	:46 4-5	1:09 3-5
Class B, Division 3B—231 to 300 cubic inches—				
22—Falcar	Gelnaw	:19 3-5	:40	:59 3-5
26—Moon	Callionette	:19 1-5	:43 1-5	1:02 2-5
21—Parry	Dull	:21	:45	1:06
23—Falcar	Pearce	:21	:45 1-5	1:06 1-5
25—Pullman	Jackson	:21 1-5	:46 2-5	1:07 3-5
29—Falcar	Hughes	:21 4-5	:48 3-5	1:10 2-5
24—Kisselkar	Schoeneck	:22 2-5	:49	1:11 2-5
Class B, Division 4B—301 to 450 cubic inches—				
36—National	Greiner	:17 4-5	:39 4-5	:57 3-5
32—Velie	Cooney	:19 3-5	:42	1:01 3-5
31—Velie	Stickney	:20 3-5	:41 2-5	1:02
34—Kisselkar	Branstetter	:21	:45 2-5	1:06 2-5
37—Jackson	Hearne	:24	:46 4-5	1:10 4-5
33—Midland	Ireland	:20 4-5	:50 3-5	1:11 3-5

The Falcar, Velie, Staver, Jackson, Parry and Moon all won is their respective classes. The formula used consisted of multiplying the cylinder capacity by the time as expressed in seconds and dividing that result by the weight of the car. Under this figuring the winners were the Brush, Cartercar, Staver, Marion and National. The Staver made the best percentage of the lot, its figures being 7.41.

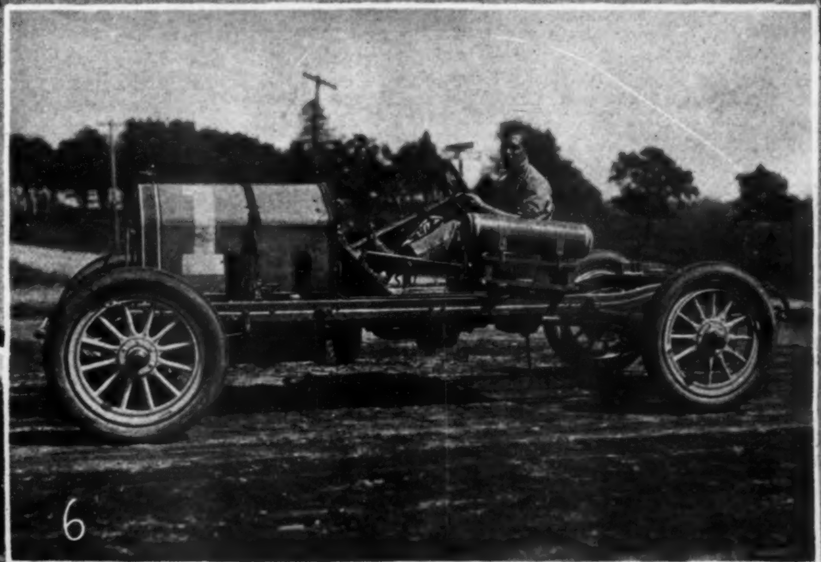


Fig. 5—The Kisselkar just after leaving the tape
Fig. 6—National, No. 55, winner of the free-for-all
Fig. 7—An immense crowd congregated at the start
Fig. 8—Marion, No. 15, winning in Class A, Division 4A

Class B, Division 5B—451 to 600 cubic inches—				
38—National	Greiner	:18 2-5	:39 4-5	:58 3-5
39—Benz	Hearne	:19	:42	1:01
Class B, Division 6B—601 to 750 cubic inches—				
40—National	Greiner	:19 3-5	:41	1:00 3-5
Class B, Division 3B—300 cubic inches and under—				
46—Moon	Callionette	:19 4-5	:41 4-5	1:01 3-5
47—Falcar	Gelnaw	:22	:40 1-5	1:02 1-5
49—Falcar	Hughes	:20	:43 4-5	1:03 4-5
48—Falcar	Pearce	:20 2-5	:44 3-5	1:05
Class B, Division 5B—600 cubic inches and under—				
50—National	Greiner	:18 4-5	:41	:59 4-5
Free-for-all—				
55—National	Greiner	:18 1-5	:41	:59 1-5
59—Benz	Hearne	:17 2-5	:42	:59 2-5
51—Velie	Cooney	:19 2-5	:41 2-5	1:00 4-5
54—Stod'rd-Dayton	Englebeck	:20	:41 4-5	1:01 4-5
52—Velie	Stickney	:19 1-5	:42 4-5	1:02
53—Midland	Ireland	:21	:44 4-5	1:05 4-5
56—Ford	Rice	:24	:44	1:08
57—Ford	Gruener	:21	:48	1:09
58—Lexington	Mattoon	:27	:52	1:19

Class A, Division 1A—$800 and under. Handicap—

No. Car	Driver	A. M. Time	P. M. Time	Total Time
1—Brush	Lincoln	3.88	4.93	8.51
Class A, Division 2A—$801 to $1,200. Handicap—				
3—Cartercar	Pendleton	2.99	5.60	8.59
2—Oakland	Harding	3.33	5.58	8.91
4—Cartercar	Hammerly	3.31	6.02	9.33
Class A, Division 3A—$1,201 to $1,600. Handicap—				
10—Staver	Monckmeier	2.36	5.05	7.41
7—Parry	Dull	2.75	5.54	8.39
8—Moline	Salisbury	2.80	6.23	9.03
Class A, Division 4A—$1,601 to $2,000—				
15—Marion	Monsen	2.73	5.27	8.00
11—Velie	Cooney	2.64	5.58	8.22
12—Jackson	Hearne	3.04	5.83	8.87
Class A, Division 5A—$2,001 to $3,000. Handicap—				
17—National	Seek	2.58	6.20	8.78

Records Fall at Syracuse

ONE AND FIVE-MILE MARKS FOR CIRCULAR TRACKS REDUCED SMARTLY—NATIONALS WIN THREE RACES AND FORD TAKES ONE

SYRACUSE, N. Y., Sept. 17—Before a crowd estimated at 80,000 persons, the automobiles had a memorable inning at the finish of the State Fair this afternoon. The program consisted of two ten-mile dashes under piston displacement classification, both of which proved victories for Nationals, but the winners turning up in different cars; a five-mile race under similar classification, which was won by an S. P. O. car; a five-mile special for residents of Syracuse, which also went to a National car; a five and a ten mile free-for-all; a ten-mile free-for-all handicap, won by a Ford, which defeated a National which won one of the other events and the S. P. O., and one and five-mile time trials against the world's mile circular track records of 49.29 and 4:24.20 respectively, both of which were reduced by a Fiat. The marks set were 48.92 and 4:11.90. Automatic electric timing devices were used and a claim for official recognition of the marks will be made.

The racing was full of action even if sturdy competition was lacking in the free-for-all races. The feature of the day's racing was the showing of the Nationals and the Ford entry. It was reported that a Simplex 90 which had been entered in several of the events broke a camshaft just before the call to the post This robbed the free-for-alls of much of the contest element.

Aside from the attractions of the card, the crowd enjoyed an address of Colonel Roosevelt which was carded to take place before the races. The speech was to have been 50 minutes long, but was shortened to half an hour by the anxiety of the crowd to see the racing machines.

The racing officials were: Honorary referees: Colonel Roosevelt and Lieutenant-Governor Horace White. Referee, A. R. Pardington. Announcer, Peter Prunty. Judges: E. L. Broadwell, Thomas J. Wetzell, Alexander T. Brown, Ray B. Smith and H. W. Smith. Clerk of the Course, Nelson C. Hyde. Timers, M. C. Kleck, E. B. Van Wagner, N. H. Oliver, W. C. Poertner, C. M. Hall and Willett L. Brown. Technical Committee: Alden L. McMurtry, John Wilkinson and S. G. Averill.

The summaries:

No. Car	Driver	Time
Five miles, cars under 300 cubic inches—		
1—S. P. O.	John Juhasz	5:28.92
2—Mercer	E. H. Sherwood	
3—Maxwell	Ellery Wright	
Ten miles, cars of 301 to 450 cubic inches—		
1—National	W. King Smith	10:10.76
2—National	Louis Disbrow	
3—Velie	Roy Robbins	
Five miles, free-for-all—		
1—Fiat	Ralph De Palma	4:24.15
2—Ford	Frank Kulick	
3—Knox	M. Lee Brock	
Five miles, special for residents of Syracuse—		
1—National	Charles Rollins	12:49.60
2—Simplex	Roy Hawkins	
3—National	Richard Gleason	
One mile time trials (track record 52 3-5 seconds)—		
1—Fiat	Ralph De Palma	0:49.13
2—Fiat (second trial)	Ralph De Palma	0:48.92
Ten miles, free-for-all handicap—		
1—Ford	Frank Kulick	11:19.73
2—National	W. King Smith	
3—S. P. O.	John Juhasz	
Ten miles, free-for-all—		
1—Fiat	Ralph De Palma	8:50.71
2—Ford	Frank Kulick	
3—National	W. King Smith	
Five mile time trials (record 4:24.2 minutes)—		
1—Fiat	Ralph De Palma	4:11.90
Ten miles, cars under 450 cubic inches—		
1—National	Louis Disbrow	9:57.26
2—S. P. O.	John Juhasz	
3—Mercer	E. H. Sherwood	

Louisville Club's Run Makes Start

LOUISVILLE, KY., Sept. 20—With less than half the number of cars entered that participated in the 1909 run, the annual Reliability and Economy Contest of the Louisville Automobile Club started this morning. The reason for the small entry list is the fact that local dealers have not yet received their 1911 models to as great an extent as they had last year at the corresponding date.

The run will be 433 miles. The route to-day is to Harrodsburg, with the Lincoln Farm as noon control, a total of 142 miles. To-morrow's route is to Winchester, 149 miles, and the third and final day will be spent in running 142 miles back to Louisville.

The tour is divided into two general divisions: one for reliability and the other for economy. In the economy division, reliability will also count as a factor in winning, but the consumption of oil and gasoline will be taken into consideration.

The cars, entrants and drivers in the reliability division follow:

No.	Car	Entrant	Driver
2	Cadillac "30"	Ira S. Barnett	W. McDonald
3	Oldsmobile Limited	Olds Motor Works	F. W. Tuttle
4	Oldsmobile Special	Olds Motor Works	Harry Smith
5	Hudson	A. L. McCormick	
6	Regal	Atlas Machine Company	W. H. Emler
8	Cadillac "30"	Ira S. Barnett	George Younger
	ECONOMY DIVISION		
1	Cadillac "30"	Ira S. Barnett	
8	Cole "30"	A. L. Martin	

The official cars include the following:

Car	Entrant	Use
Cole "30"	A. L. Martin	Press
Packard	Lee Miles	Pacemaker
Oldsmobile	Olds Motor Works	Confetti

Richmond Endurance Attracts Entries

WASHINGTON, D. C., Sept. 18—Ten cars have been entered to date in the five-day endurance run to Richmond and return under the auspices of the Washington *Post*. The entries are three Buicks, two Oldsmobiles, two Washingtons, two Maxwells and a Columbia. The dates selected are October 14-18, giving four running days with a Sunday layover in Richmond. The distance is 475 miles.

The route is via Leesburg, Winchester, Staunton, Charlottesville, Scottsville, Columbia, Richmond, Louisa, Orange, Locust Dale, Culpeper, Warrenton. The night stops will be Staunton, Richmond and Warrenton.

The probabilities are that 25 cars will compete. In addition to a trophy for each division, there will be a sweepstakes prize.

Southern Race Meet a Success

COLUMBIA, S. C., Sept. 17—The two-day race meeting staged at the Fair Grounds here yesterday and to-day proved a big success from every viewpoint. There was one race yesterday, a 100-mile affair with six entries, which was won by a Buick by two minutes in 1:58.5. To-day's card consisted of three events, one each at one, five and fifty miles. The Ford entry won the mile race in 1:09, the Pullman took the five-mile event in 5:51 3-5 and the fifty-mile trial was annexed by the Ford in 55:53.

The long races were well contested, the win of the Buick having been accomplished through its good fortune in avoiding mechanical and tire trouble at all stages as well as to its speed. The Ford car won rather easily after a series of early brushes which accomplished the downfall of several of the heavier cars.

Engineering Section

DEVOTED TO THE DISCUSSION OF ENGINEERING PHASES OF AUTOMOBILING, INCLUDING DESIGNING AND CONSTRUCTION FEATURES OF PRODUCTS, AND INFORMATION TO AUTOISTS

GOOD MATERIALS MUST BE CAREFULLY STORED AND PREVENTED FROM BEING MIXED—DIAMOND CHAIN METHOD

MAKING a mistake when the proceeds of a day's work as represented in money are being counted, may result in the loss of a few dollars, which in the long run is readily charged off to profit and loss, and the amount of the damage resulting may be directly measured by the magnitude of the error made in the counting. But if in a plant where automobiles are being made a large variety of materials are found to be necessary for the best result, and the materials are not so separately stored that error creeps in, the opportunity for putting the wrong material into a part requiring a better grade of the same will be ever present, and the extent of the loss involved in the event of such an occurrence may be far beyond that as represented in the error of count as before mentioned.

It is out of the question to expect that the average workman will be able to tell a bar of chrome nickel steel from a Bessemer bar, if the two bars are of like diameter and stored in the same rack. Of course, the machinist who has to do the work would know the difference due to the cutting hardness of the one as compared with the other, but even his method of measuring would fall short of the requirement were a comparison to be made between a Bessemer bar and a piece of acid open-hearth steel of the same carbon content.

It would not be out of place to expect excellent results from crankshafts made of acid open-hearth steel, but should the materials be stored promiscuously, and the workman, through some inadvertence, were to use the Bessemer steel in the forging of crankshafts, the cost of this carelessness would be measured by (a) the cost of the Bessemer steel wasted, (b) the cost of forging the

same, (c) the cost of machining work done upon it, (d) the cost of bluing, scraping and fitting, (e) the cost of the interruption of service and of the crankshaft brakes, (f) the cost of laying up the car while a new crankshaft is being made and put into position, (g) the extra cost involved in making the new crankshaft, (h) the cost of besmirching the reputation of the maker.

There are now so many sizes and grades of steel used in the better class of automobile work that it is no longer possible for any store-keeper, no matter how skilled he may be, to keep track of the respective grades and to be able to put his hands upon them promptly and on a sufficiently definite basis to satisfy the exacting demand. The illustration, as here afforded, is of the method in vogue in the plant of the Diamond Chain & Manufacturing Company, of Indianapolis, Ind. The racks as shown are placed on the ground floor of a substantial fire-proof building; they are of structural steel and the respective compartments are in point of dimensions fixed in the light of the quantity of each grade of steel carried in stock. In addition to having the respective grades of steel stored in separate compartments, it is the practice at this plant to paint the ends of the bars, using distinctive colors for the respective grades of the materials carried in stock. The question of just which color to adopt for a given grade of steel is a matter of no moment, provided this color is definitely assigned once and for all, and is never used for any other such purpose.

This plan works out to advantage in other ways besides making mistakes impossible. Workmen learn to do things systematically, if the system is plain and attracts their notice, and it has been found in this case that the men who do the work are really fond of daubing paint over the ends of the bars, the reason for which lies in the fact that it is easier work to paint bars than it is to lift steel. Evidently this painting project appeals to the artistic side of the workman, and it is one of the situations that illustrates perfectly the exercise of business acumen involved in a system that caters to the vagaries of men.

1911 Laboratory Prospects

SECOND INSTALLMENT, DEALING WITH THE LABORATORY SUBJECT AS IT IS HANDLED BY MAKERS OF AUTOMOBILES

AUTOMOBILE users' interest in the laboratory question ceases when the road performance of cars is analyzed. It is worth something to the user to know the limitations of automobiles, and to be able to foresee the limit of profitable performance. There are a great many things that it is possible to do with automobiles, but the question is, will it pay? In other words, what are the commercial limitations of the automobile? It seems to be convenient to overlook the fact that it is a commercial enterprise that is represented when a banker is taken from his residence to his place of business, or when the banker's wife is carried in comfort and in style when on shopping bent. It is even a commercial enterprise when the banker's daughter is transferred from her place of abode to the music master, and it is not far-fetched to hold that there is a certain commercial phase represented in the process by which the banker's son invests in a racing automobile and traverses a whole State, touching the high spots only.

Just what is the commercial aspect represented in the mad prank of the banker's son? Does he not represent the only laboratory that was in existence during the earlier life of the automobile art? Who is it of the pioneers of the automobile industry whose memory falls short just before account is taken of the speed-mad laboratories that paid good money for his make of automobile and served in the capacity of the dog on whom the lack of quality of the product was tried out with a view to finding out whether or not it was any good.

That these brave and enthusiastic autoists accomplished all that could have been mastered even in a laboratory at the time is a point that will be well appreciated by all who take into account the fact that in addition to locating the weakness in cars, there was the further advantage of conducting the tests under severe road conditions. Now that the art has progressed, and the automobile has lost much of its glamour, most citizens are willing to decry speeding, and they discountenance recklessness as it is practised by the banker's son who lacks neither money nor red blood.

It is fitting that the users of automobiles shall conduct their experiments in club laboratories rather than to indulge in

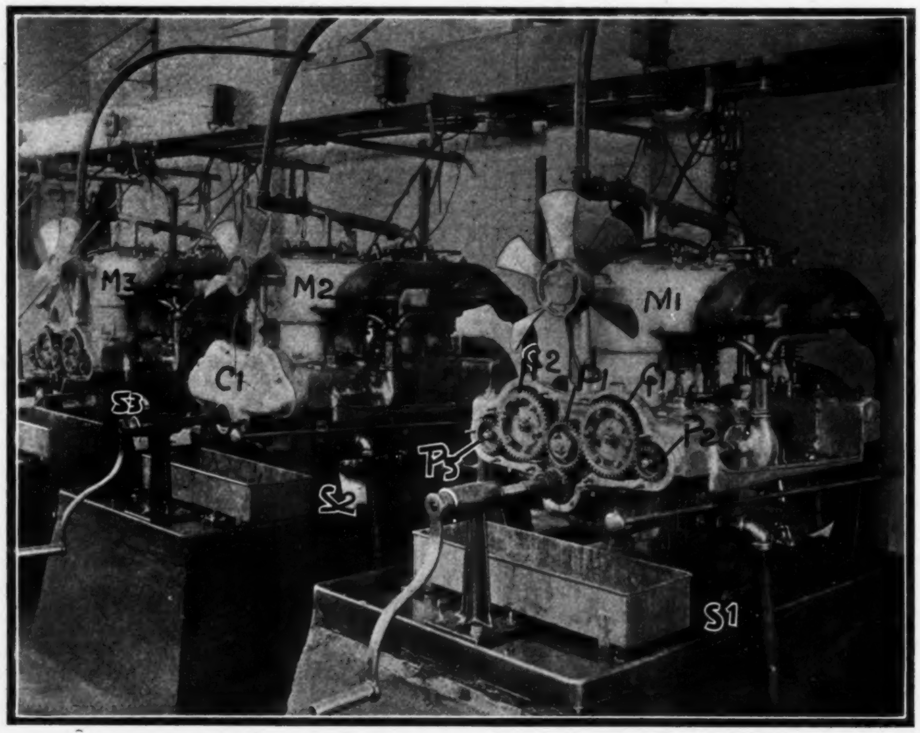


Fig. 16—Run-in test of completed motors at the Lozier plant, with means for loading and determining proper relations of parts

reckless driving on the road, and that the equipment shown as having been installed by the Automobile Club of America is representative of progress from the users' point of view may be taken for granted. The fact remains, notwithstanding anything that users may do along the line as here indicated, that tests should be made and laboratory investigations are better conducted before the cost of building the automobile is incurred. It is like locking the door after the horse is stolen, to avoid making tests during the construction period, only to do this testing work after the cars are built and sold.

The new idea, if indications count, has for its basis a full and proper investigation along laboratory lines during the constructive period of cars and a more or less careful review of the situation on the part of owners after the cars are made. There is one further point of interest, however, that has not been touched upon heretofore, *i. e.*, the Automobile Club of America and kindred establishments, to the extent that they indulge in laboratory work, offer excellent facilities to autoists of the class whose minds run to invention. If a member of the club, as a result of his experience, finds himself in the predicament of having an idea that refuses to down, he may go to the club laboratory and have the same translated into the form of a device or mechanism, and then he may have the plan put to practical test, and if it proves to be efficacious in the filling of a useful niche, all that remains is to add the commercial touches. In this way the experience of capable autoists is given to the world, and it is only in this way that matters such as this can be handled.

In the shops where automobiles and accessories are made commercial success depends upon concentration. The representatives of these plants have no time to devote to incidental experimenting; their success lies in confining their efforts to the undertakings for which the plants are instituted. Of course, there is a bond of sympathy between the man who in using a car discovers something that will benefit the art and the man who in making the car finds out that the degree of perfection he aims at is retarded for lack of something. The club laboratory should serve as the instrument by which a connection can be made between the user who finds out something and the maker who has a place to put it.

Fig. 9—Depicting the method in vogue in the Packard plant for inspecting valves

Fig. 12—Method of determining the static balance of a crankshaft after the flywheel is pressed on

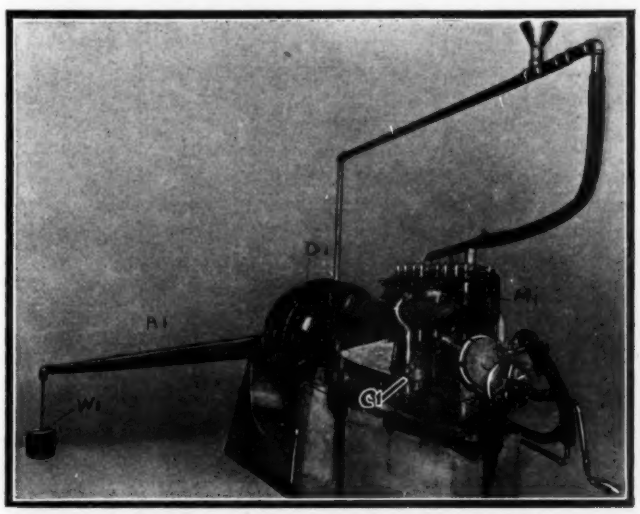


Fig. 15—Electro-dynamometer as used in the Inter-State plant at Muncie, Ind.

Some of the Methods in Vogue in the Shops

In some plants instead of having a separate laboratory devoted to testing and the various investigations the instruments of precision and equipment used for testing are distributed about and utilized in an incidental way. In other establishments the laboratory equipment is separated from the manufacturing plant, and the various tests and investigations necessary in the industry are conducted by a corps of men who do nothing else. It will not be the purpose here to attempt to determine as to the respective advantage of each of the methods; it is even possible to foresee that it makes very little difference whether a test is conducted in one room or another so long as the facts are brought out and they are utilized to good advantage. Fig. 9, for illustration, shows how valves are tested for accuracy in the Packard plant, in which L_1 is the bed of a small lathe, H_1 is the headstock, and T_1 is the tailstock. Holders H_2 and H_3 with adjustments take the V's, V_1 and V_2, into which the stem S_1 of the valve is placed, and the accuracy of the beveled seat B_1 is determined by means of the extensometer E_1. The work is quickly done, and an error of 0.0002 is readily detected, although the workman is enabled to reach a speed of from 20 to 30 valves per minute. There is no reason why this operation should be conducted in a separate laboratory, and it is even possible to foresee advantage in having the inspection performed during manufacture and as one of the regular operations. The moral effect of letting the machinist see that he must do accurate work, or have it thrown back on his hands, is worth more than can be estimated readily. The workman is most impressed by things that he can see and understand.

In the same plant the motor crankboxes and the transmission gear cases are machined in the regular way, and it is to be presumed that the jigs and fixtures utilized will influence for rapid and accurate work. Notwithstanding the excellence of the facilities afforded, it is deemed fitting to have each unit set up on a face plate and measured by a man skilled in this class of work. Referring to Fig. 10, F_1 is the face plate, C_1 is the lower half of the crankcase, C_2 is the upper half of the same. The two members are bolted together after they are machined and are rested upon legs L_1 and L_2 at one end, with a screw jack S_1

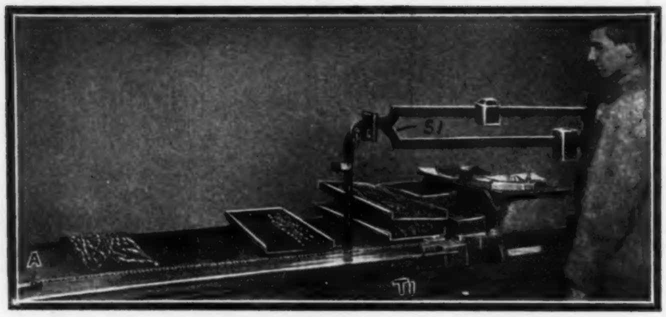


Fig. 14—Testing completed chains in the plant of the Diamond Chain and Manufacturing Company

placed to serve as the third support. The castings are provided with accommodation pieces which are milled off to a fixed distance from the flange faces so that when the legs L1 and L2, which are of a fixed length, are set up in position and the crankcase is rested thereon, the operator using a face gauge F2 fitted with an extensometer E1 has at his disposal a quick and accurate means of checking the work. He is enabled to observe with certainty the limits of tolerance maintained by the workman, and he can do this checking work in the shop alongside of the men who do the machining just as well as it may be done in a separate department devoted to inspection undertakings.

Illustrative of an important phase of constructive investigation work in the shop, reference may be had to Fig. 11, which was taken in the Packard plant, showing the face plate F1, with a crankshaft C1 and V-blocks V1 and V2 with instruments at hand for determining the accuracy of the work. The extensometer E1 is employed to determine if the main bearings are in alignment; it also tells if the centers C2 and C3 are identical as to axis. The fixed gauge G1 is used to size the holes H1, of which there are six, and the micrometer M1 is available for measuring the diameters of the pins, which measurements are taken at both ends, and at 90 degrees, it being the purpose to determine if the pins and bearings are round or elliptical, parallel or conical. The first requisite in the conduct of work of this character is a surface plate that is surfaced to great accuracy and so designed that it will not distort under temperature-changing conditions, to which must be added fixed gauges, extensometers and micrometers of known excellence, all of which in the hands of a skilled inspector.

As a further illustration of the excellence of the incidental method of checking the work during the process of manufacture reference may be had to Fig. 12. Here the crankshaft C1 with its flywheel F1 is mounted on V's V1 and V2, the latter being formed at the upper extremities of a pair of castings which have faced-off bases B1 and B2 designed to rest upon a cast-iron foundation F2, which is also machined with great accuracy, and is provided with crow feet C2, of which there are four with leveling screws attached, thus permitting the workman to level the V's, and after setting the crankcase in place and imparting angular motion thereto, it is allowed to some to rest unhampered, and the operator merely observes if the crankshaft with the flywheel in place is in a true state of static balance.

It is not the purpose of this test to arrive at an understanding of the kinetic conditions of the crankshaft and flywheel. This phase of the problem is taken care of during the designing process; kinetic balance is a mathematical matter to be disposed of, and since the design is symmetrical if the crankshaft and flywheel are machined to drawing size, the static balancing method is a very simple one by means of which inaccuracies in the manufacturing process are readily detected. This is another case of checking as incidental to the manufacture process, and there is no reason why this work should not be done in the very room where the parts are brought together and assembled.

Testing work is not necessarily confined to the processes by which inaccuracies of one or two ten-thousandths of an inch are determined; it is just as necessary to find out, for illustration, if the radiators are tight. Fig. 13 shows how this is done in many of the plants (this particular illustration being taken from the Packard), utilizing a compressed-air tank T1, fitted with a gauge G1, and a safety valve S1 with a pipe leading from the tank along the side wall to a point adjacent to the testing tanks. A length of hose H1 leads to each testing tank and is connected to the radiator R1 to be tested, the latter being submerged in water in the manner as shown, the tanks T2 being deep enough so that when the radiators are immersed therein they will be covered over by water. As the compressed air leads from the tank T1 to the piping and hose H1 to the radiator R1 if any of the air leaks out it will bubble up through the water and indicate the proximity of the fault in the radiator. The air pressure is high enough to develop weaknesses in the structure of the radiators, and it is a quick and efficacious way of locating any leaks that may obtain after the radiators are supposed to be finished. Each radiator bears the number of the workman who would be held responsible for faults, and his attention is directed to any of the faults of workmanship that may be properly charged to him. If the weaknesses developed are due to faulty material this fact is also arrived at, and it is in this way that perfection finally takes up its abode in an automobile. It is a clear case of the elimination of the weakling idea and of the fitting survival of the worthy thought.

Checking up the work as it is represented by the component

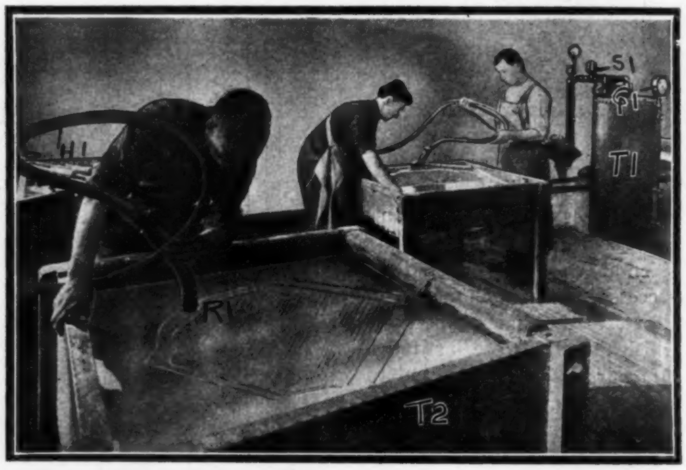


Fig. 13—Testing radiators by compressed air to locate leaks and to prove mechanical strength

parts that go to complete a unit is only one phase of the great main situation. As the component parts are made and tested, if they are found to be accurate, the next step is by way of assembling the components into units. When these units are assembled they have to be tested also in order to ascertain whether or not they will work in harmony. Fig. 14 is a capable illustration of the idea to be conveyed. It was taken at the works of the Diamond Chain & Manufacturing Company, at Indianapolis, Ind., showing the final test to which chains are put after they are made but before they are packed ready for shipment. The test is made by fastening one end of the chain to an anchor A1, and the other end of the chain to a traveler T1, the latter being actuated by a lever under the control of the inspector, but the pull in pounds is measured on the beam of the scales S1. A certain number of the sprocket chains are tested to destruction in order to find out what the ultimate strength is, but all of the chains that are sent out to do service are tested to some percentage of the ultimate strength, the latter being some multiple of the safe working load. As a rule it is found that of the few chains that do show lack of ability the fault lies in a structural imperfection of the material in some one of the links. The inspection department is fitted out with the facilities by means of which the defective link is at once replaced by a good one and the chain is immediately thereafter retested and if it stands up to the retest it is passed into circulation. There is a certain

deliberate accuracy attached to this process. It is quite as scientific as ingenuity is capable of inducing, and yet it has the speed, coupled with precision, that makes for commercial success.

While the opportunity affords it may not be out of place to enlarge somewhat upon the advantages that are inherent in the very process of testing, that instead of impeding progress offers a potential value, as in the case above cited. It is the experience of every shop man that the laboratory and methods of testing and checking to whatever extent they impede progress are unpopular. When a scheme invites accuracy and augments speed, its popularity is assured, and the results obtained under such conditions will be distinctly a commercial success.

Problem Is Intensified as It Leads Up the Line

It will be recognized that the practical inspection and test of the units and the further inspection of the incidental assemblages are all preliminary to the more complete investigation of the assemblies that go to make the completed car. Referring to Fig. 15, which is an electro-dynamometer D1 coupled to a motor M1, this may be taken as one of the units in a considerable testing plant that is designed with a view to testing every motor made with sufficient accuracy to assure the maker that its timing is on a proper basis and that its torquing ability under the several conditions of speed will be up to the standard set by the company for its product. In a test such as this the carbureter C1 is investigated to observe its range of performance. By calibrating the dynamometer and using the curve of calibration the laboratory expert is permitted to note at a glance for every speed within the working range of the motor whether or not the carbureter is delivering a capable mixture. The weight W1 on the end of the arm A1 that will just hold the arm horizontally at any given speed may be fixed by consulting the curve of calibration, and if the carbureter is capable the motor will furnish the necessary power to conform to the general demand as indicated by the curve of calibration. As the speed of the motor is increased in response to the will of the operator the weight W1 is changed accordingly, and the torquing curve of the motor being tested may be plotted in a few moments if the carbureter is working properly, the timing is right, ignition is up to a fitting standard and the conditions of lubrication are as they should be; but should the motor fall below the standard set the means at hand are such as to enable the operator to quickly investigate the situation and put his finger on the festered spot.

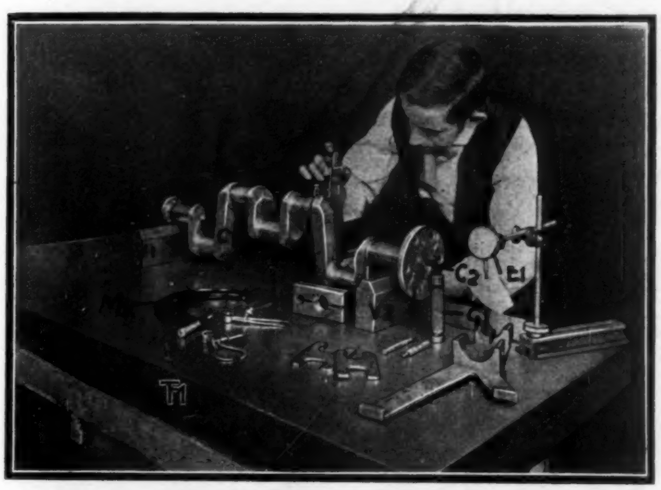


Fig. 11—Inspecting crankshafts in the Packard plant, using micrometers, fixed gauges, and extensometers under proper conditions

As a further advance embodying the laboratory idea with the practical situation, the makers of automobiles undertake to put the units through that which is known as a run-in test. Fig. 16 will suffice for the moment as indicative of the idea in which the motors M1, M2 and M3 are in a long row on test stands S1, S2 and S3, of which there are a sufficient number provided to test all the motors made as fast as they are produced. There is working room around each test stand so that the testers are enabled to inspect the motors under running conditions, finding out if all the joints are tight, and noting whether or not there is any noise or disalignment of relating parts. As the illustration shows, the cover C1 of the half-time gear housing is removed from two of the motors shown, disclosing the pinions P1 and the half-time gears G1 and G2, also the pinion P2 that drives the water pump and the pinion P3, which is placed to actuate the magneto. If this train of gears is not properly installed the tester will be able to note the fact; if there is any noise he will undertake to locate the cause thereof, and in fine the great value of the run-in test lies in the opportunity afforded for determining under working conditions just how good the performance is, and if a remedy becomes a necessity the reason for the same is not hard to find.

Caring for the Automobile Top

As an important feature of proper car equipment, the automobile top is deserving of a degree of attention commensurate with its relative value as a factor in automobile service. It is an expensive part of the car, and it is exposed to a particularly harsh form of service.

It is crushed together, and in this position made to serve as a receiver of highway dust and dirt, and during storms its extended surface is mercilessly assailed by the elements, so that, on the whole, unless given exceptional care and fortified with some preservative material designed to strengthen and enlarge its capacity for service, the days of its usefulness are destined to be few.

The directions for caring for the top are, in the main, simple and not many. Clean as often as possible of mud, road dust and dirt accumulations of every sort, all of which are injurious to the leather, rubber or other fabric composing the top. In case these accumulations have taken hold of the surface of the top so that a light dusting will not suffice to remove the matter, whip a bit of castile soap in some clean, tepid water to make a froth of suds, and wetting up a soft sponge in the water, go over the top until thoroughly cleansed.

Never let this dirt and fetid matter remain long upon the top. Such substances destroy the enamel of the leather or rubber and this gone it is a short shift to decay for the top. After sponging off the top always dry it off with a wash leather.

With leather and rubber tops upon which the enamel remains intact and vigorous, this bathing in water, smoothed out with a spray of castle soap, as often as the top becomes foul with the filth of the road will to no mean extent prolong the wear of the fabric.

For the rubber top with a worn, broken and fractured enamel, showing a generally service-stricken surface, a dressing of real worth may be prepared as follows: Liquid asphaltum, one part; unrefined castor oil, three parts. Confine in a close vessel and agitate until a complete unity of the ingredients is secured. Should the dressing lack a sufficiency of black, add a bit of drop black cut with turpentine to a paint consistency. This will also do for the leather top. The castor oil renders the rubber or leather soft and flexible and neutralizes the tendency of the asphaltum to become brittle.

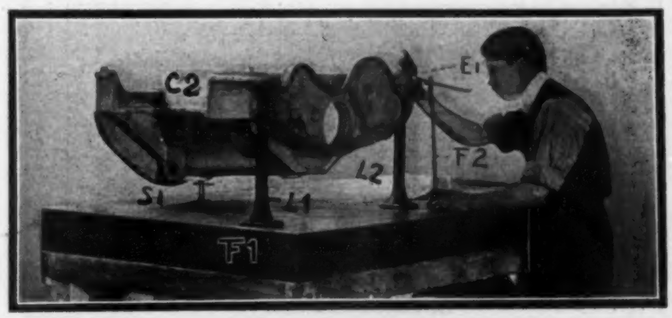


Fig. 10—Surface plate and gauge as used in the Packard plant in measuring up crankcases

Questions That Arise

CONCERNING THE POWER OF A MOTOR IN DIRECT PROPORTION TO SPEED; WORM-GEAR FORMULAE; CLEARANCE VOLUME IN CYLINDERS; TESTING PISTON DEFORMATION

[225]—Is the power obtainable from a motor in direct proportion to speed? If not, how does the power increase and when does it begin to recede as a result of the ills that creep in with increasing speed?

The following test is representative as a good average result, although the conditions indicated are considerably below the best expectation. In this chart (Fig. 1) the speed is plotted in revolutions per minute as ordinates and the horsepower output of the motor is given as abscissa. It will be observed that the line of increasing power is almost straight between 1,000 and 1,500 revolutions per minute. The peak of the curve takes place at 1,600 revolutions per minute, from which point on the power falls off at a rapid rate, it being substantially the same at 2,000 revolutions as it is at 1,000 revolutions per minute. For the purpose of showing that the power did not increase in direct proportion to speed at any time, it is only necessary to point out that at 1,000 revolutions per minute the power was 21 horsepower. The power should be 42 horsepower at a 50 per cent. increase in speed (1,500 revolutions per minute), but instead of 42 horsepower at this higher speed, the actual delivery was 40 horsepower.

[226]—What is the most simple formula of the worm gear, by means of which it will be possible to design worm gears for various purposes, including worm and sectors for steering equipment?

The following is conventional and sufficiently complete for the purposes named. It will be understood that a sector as used in steering gear is designed as a complete worm gear so that the formulæ of the worm gear applies perfectly. The illustration given is for the purpose of illuminating the text (Fig. 5).

CONVENTIONAL FORMULAE OF WORM GEARS USED IN DESIGNING

$$D = \frac{y\,P}{\pi} = 0.3183\,y\,P;$$

$$B = D + 0.6366\,P;$$

$$C = B + 2\,(N - N\cos A);$$

$$F = \frac{D + D'}{2};$$

$$M = \frac{D'}{2} + 0.368\,P;$$

$$N = \frac{D'}{2} + 0.3183\,P;$$

$$E = D' + 0.6366\,P;$$

$$B' = D' - 0.736\,P;$$

$$\text{Tang. } S = \frac{L}{\pi D};$$

$$L = P\,Z;$$

$$P = \frac{L}{Z};$$

$$Z = \frac{L}{P};$$

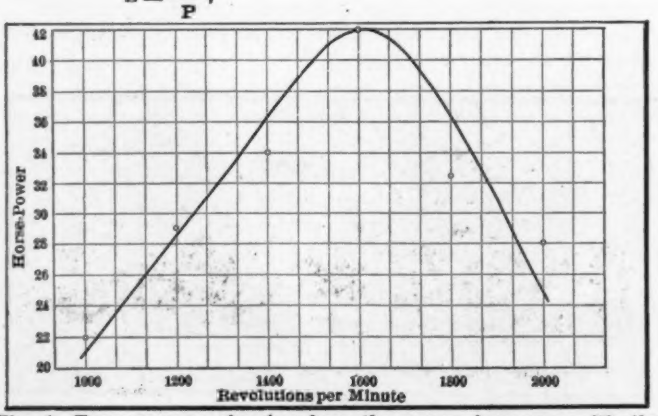


Fig. 1—Torque curve showing how the power increases with the speed up to a certain point and then falls away

y = number of teeth in the worm wheel;
P = circular pitch;
S = lead angle in degrees;
tooth angle = 29 degrees.

[227]—Is the clearance volume exactly the same in each cylinder, considering motors turned out in regular practice?

There seems to be quite a little difference considering the tests available for inspection. With the difference as noted in the test here given, the performance of the motor appears to be up to every reasonable standard.

ACTUAL CLEARANCE VOLUMES

	CC	Cubic Inches	Per cent. of total volume
1	302.5	18.5	19.1
2	297.5	18.2	18.75
3	285.5	17.4	18.2
4	302.5	18.5	19.1
5	302.5	18.5	19.1
6	305.0	18.8	19.4

Piston displacement 78.3 cubic inches.

[228]—What is the practical performance of ordinary spark coils? Is there much lag?

The curve as given in Fig. 4 shows the performance of an ordinary spark coil; the lag is given as ordinates in degrees and the sparks per minute are given as abscissæ. Up to substantially 2,600 sparks per minute the plotting shows a straight line with a maximum lag of 20 deg.; after this the lag increases at an enormous rate, reaching nearly 50 deg. at 3,000 sparks per minute.

[229]—Is it possible to make pistons so light, that is to say, have the walls so thin that they will buckle in service?

It is suspected that this is a very ordinary difficulty and that

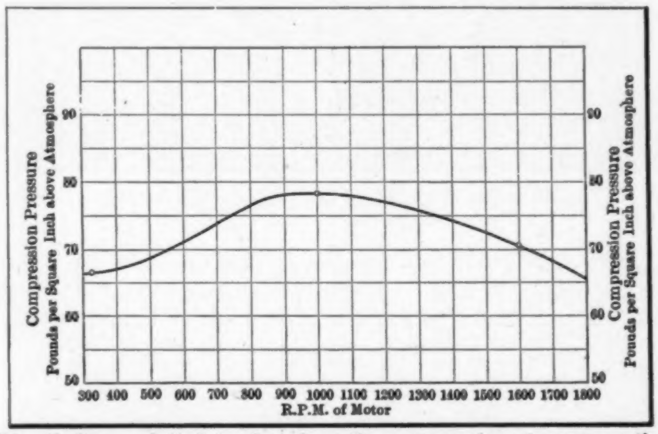


Fig. 2—Curve plotted to show how the compression changes as the speed of a motor is changed

it occurs in more cases than most autoists are cognizant of. The following test was made to ascertain the extent of piston deformation in one case; it is unimportant excepting to point out that piston deformation takes place if design is not proper:

Block Test to Determine Piston Deformation

Engine has been through testing block room and was taken out of stock. A marked heating effect was noticed, and after non-continuous running for a day the motor was torn down and the following measurements taken. Cylinder should be 3.625". Drawing calls for 3.622 straight except light chamfer near top bridge. Pistons are rough turned and filed, being in some cases touched up with emery cloth.

FOR THE PISTONS

Cyl.	Parallel to wrist pin	Right angle to wrist pin	Clearance: Parallel to wrist pin	Clearance: Right angle to wrist pin
1	3.6215	3.6230	.0035	.0020
2	3.6220	3.6235	.0030	.0018
3	3.6221	3.6215	.0034	.0040
4	3.6225	3.6220	.0026	.0030
5	3.6225	3.6225	.0025	.0030
6	3.6220	3.6243	.0033	.0010

FOR THE CYLINDERS

			Clearance	
cyl.	Parallel to wrist pin	Right angle to wrist pin	Parallel to wrist pin	Right angle to wrist pin
1	3.625	3.625	....	....
2	3.625	3.6253	....	....
3	3.6255	3.6255	....	....
4	3.6251	3.6250	....	....
5	3.6250	3.6255	....	....
6	3.6253	3.6253	....	....

[230]—What is the usual arithmetical way of ascertaining percentage clearance in an internal combustion motor cylinder?

The first operation will be completed when the volume of clearance in cubic inches is known; the next step is to determine the volume in cubic inches of the space swept by the piston. With these data available the following will hold:

$$\text{Percentage clearance} = \frac{\text{Volume of clearance}}{\text{Volume of clearance} + \text{volume of piston displacement}}$$

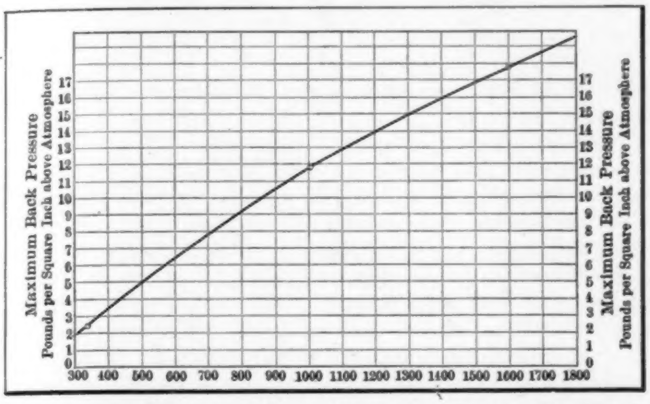


Fig. 3—Curve plotted to indicate the extent of back pressure of a muffler and the effect of increasing speed on the same

Volumes to be measured in cubic inches.

A numerical example is as follows:

Volume of clearance = 13.73 cubic inches.

Volume of piston displacement = 44.51 cubic inches.

$$\text{Percentage clearance} = \frac{13.73}{13.73 + 44.51} = 23.6.$$

[231]—Is the compression pressure constant or does it change with the speed of the motor?

In poorly designed motors the "cold" compression represents the highest point in the compression line. With such motors as the speed increases the compression decreases. This is due to wire drawing and other obstructive troubles to some extent and to back pressure on the exhaust side and inferior cooling for the rest. In fairly well-designed motors the compression increases with the speed of the motor for a part of the range, holds substantially constant over the working range and falls off slowly with increasing speed beyond this point. The curve, as given in Fig. 2, is representative of what might be termed good performance, in which the speed of the motor is represented as ordinates and the compression pressure is given in pounds per square inch above the atmosphere. An approximate tabulation of the results obtained in this case may be stated thus:

VARIATIONS IN COMPRESSION PRESSURE FOR VARIOUS SPEEDS

Revolutions per minute	Compression pressure in pounds per square inch above atmosphere
400	67.0
600	71.0
800	76.5
1000	78.5
1200	77.1
1400	74.3

The curve shows that the compression increased gradually up to about 800 revolutions per minute, remained almost constant between 800 and 1,300 revolutions per minute and fell away gradually as the speed increased up to 1,800 revolutions per minute. The running compression was almost as high as 1,800 revolutions per minute as it was cold.

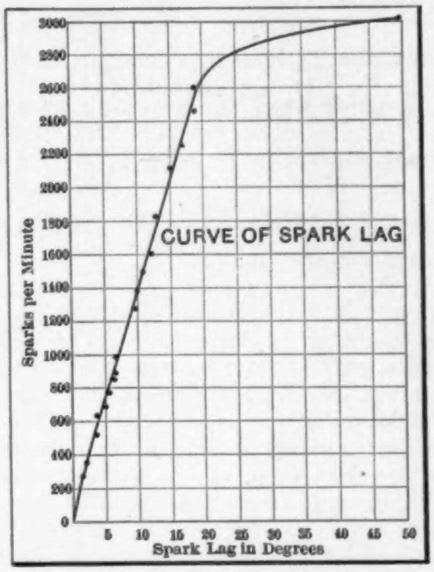


Fig. 4—Curve plotted to show the lag of spark of a spark coil as the speed of sparking is increased

[232] — Can mufflers be relied upon to eliminate the disagreeable sound without inducing back pressure?

As a rule, the reduction of sound from the exhaust of an internal combustion motor is at the expense of power. There are certain forms of mufflers that do better than others, but how much better can only be ascertained by proper tests. For the purpose of showing that back pressure does obtain and that it is in sufficient presence to merit serious consideration, a chart is offered (Fig. 3), a study of which will be enlightening. The speeds of the motor ranging between 300 and 1,800 revolutions per minute are charted as ordinates. The back pressure, which is given in turns in pounds per square inch above atmosphere, increases with speed as the curve shows and the variations in pressure are shown as abscissa. This chart says that for the particular muffler employed the back pressure increased with the speed as follows:

APPROXIMATE INCREASE IN BACK PRESSURE WITH INCREASING SPEED

Revolutions per minute	Pounds per square inch above atmosphere
400	3.22
600	6.2
800	9.11
1000	11.95
1200	14.1
1400	16.0

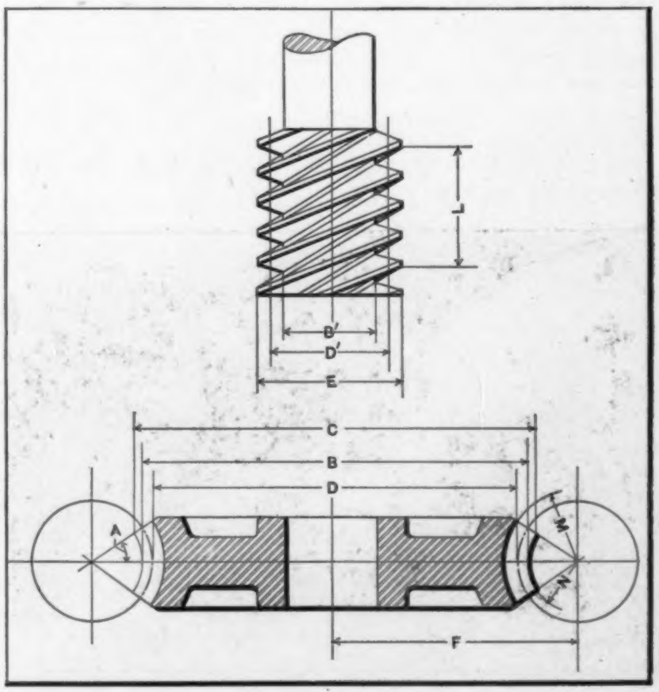


Fig. 5—Diagram of worm and sectors for steering equipment

Letters

COMMUNICATIONS FROM READERS MAINLY ALONG TECHNICAL LINES; LENGTHENING THE LIFE OF TIRES; CLAIMS OF THE KNIGHT PATENT; BRAKES SHOULD BE ADJUSTED WITH CAR LOADED; CARBURETER POPPING DUE TO POOR MIXTURE

Life of a Tire May Be Increased Considerably

Editor THE AUTOMOBILE:

[2,367]—I do not wish to complain, but it occurs to me that my tire bills are out of proportion, they being too high, and I fail to see how some of your good (?) advice can be taken excepting with a grain of salt. You say keep the tires fully inflated and they will last very much longer than otherwise, due to the fact that flexure will be reduced to a minimum. This is all very well, and there probably is something in it, but when I inflate the tires on the wheels of my car so that flexure is prevented it rides like a lumber wagon every time the speed is brought up to 40 or 50 miles per hour. Is it not a fact that the life of the rest of the automobile will be reduced to pulp if I inflate the tires so solidly that they will not cushion, since then the shock at high speed is so pronounced that it becomes uncomfortable to ride in the car?

New Rochelle, N. Y. C. M.

Take another grain of salt and think it over. Why should you drive your car so fast that you not only disrupt the speed limit but reduce the automobile to pulp as well? Perhaps your pocket book is perfectly capable of standing the strain even if the tires will not. There is a legitimate expectation from every make of automobile. You persist in passing beyond that point and prefer to ruin the tires of the automobile in order that you can indulge in your mad desire to wipe out the scenery, whereas were you to blindfold yourself you would not be bothered by scenic considerations, and with the speed reduced to a proper level the car would perform comfortably, the tires would last for a long time, and the cost would be low enough to permit an ordinary millionaire to pay the bill. Running on partially inflated tires results in all sorts of penalties, one of which is here illustrated. (Fig. 1.) In this case the tire was so soft that it picked up a railroad spike.

Yoke Type of Universal Joint

Editor THE AUTOMOBILE:

[2,368]—I have ball and socket joints on the steering rods of my car and it is my belief that they are not as good as if the bearings were long as in the usual form of bearing; since the action has to be universal, how must the joints be made?

W. W. CRANDALL.

New York City.

The idea can better be illustrated than described. Fig. 2 will suffice for the purpose.

Fig. 1—Running on a soft tire—picked up a railroad spike

Sawdust May Be Put to Good Account

Editor THE AUTOMOBILE:

[2,369]—Is there anything that will effectually remove grease and grit from the hands after working with machinery? G. B.

Chihuahua, Mexico.

Take a quantity of sawdust, wet it with gasoline, add soap and use it for the purpose.

Letters Patent of the U. S. Issued to Knight

Editor THE AUTOMOBILE:

[2,370]—In THE AUTOMOBILE of Sept. 8 it was stated that the Knight patent has been issued; what is its principal claim?

Chicago, Ill. C. L. G.

The Knight patent was issued on Aug. 23, to Chas. Y. Knight, of Oak Park, Ill., the number of which is 968,166; a one-half interest in this patent is assigned to Lyman Bernard Kilbourne; the present control of the patent, according to advices, is vested in Knight & Kilbourne, of Chicago, Ill. The original application for the patent was made April 4, 1904. There are 28 claims; they are broad and sweeping; the "combination" claim is as follows: 28.—"In an internal combustion engine the combination of a fixed cylinder having intake and exhaust port, a cylindrical head projecting into said cylinder and spaced from the walls thereof and forming an annular space therewith, two concentric cylindrical elements telescoped with said cylinder over said head, around the combustion space of the engine, reciprocally in said annular space, the inner one of said elements having ports adapted to communicate with the said intake and exhaust ports and engaging the exterior of said head for controlling said ports therein and the outer one of said elements engaging the interior face of the fixed cylinder for controlling the said ports therein, a working piston reciprocating axillary with relation to said elements and surrounded by the inner one thereof, speed reducing means positively connecting the piston with said elements for reciprocating them with relation to the said head and fixed cylinder, and means for firing a charge in the explosion space." (See Figs. 3 and 4.)

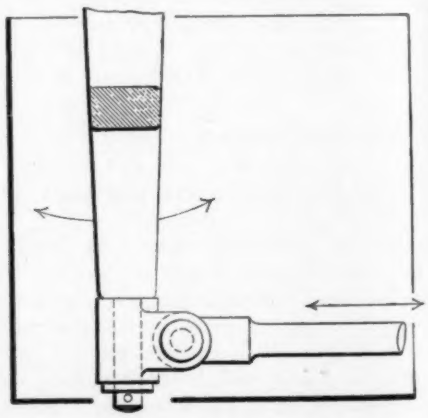


Fig. 2—Idea of a lever and rod with a universal joint connection, designed to supplant the usual ball and socket joint

See Page 287, The Automobile of August 18th

Editor THE AUTOMOBILE:

[2,371]—I was much interested in reading in your last issue your article giving the decision on the Selden patent.

For the information of myself and a great many other automobile owners, will you kindly give us the information as to when this patent expires, and if owners of unlicensed cars are in any way liable under such patent. M.

New York City.

The decree handed down by U. S. Circuit Judge Hough on

July 19 was given in full in THE AUTOMOBILE on page 106, issue of July 21. This decree was put into force by the action of the same judge, a memorandum of which was printed on page 287 of THE AUTOMOBILE of August 18. According to the information afforded, letters patent of the United States were issued to George B. Selden on November 5, 1895, No. 549.160, for improvements in road engines. The patent expires in 16 years from the date of issue. THE AUTOMOBILE, realizing the great importance of this patent, and having in mind the possibility of a new lease of life of the same, went into the matter at some length, even to the extent of consulting with legal talent, and as a result of this effort it was concluded that a reissue is not impossible. Should there be a reissue, it will be for 16 years.

Emergency Brakes of No Value Whatever

Editor THE AUTOMOBILE:

[2,372]—The puzzle that I have to solve has been with me for some time and I have tried to have it straightened out several times. Up to the present I have expended $70 without any good result, and a friend of mine who takes THE AUTOMOBILE states that you will solve my problem promptly and without any payment at all. The difficulty is this: When I tighten up the emergency brakes just as tight as they can be without dragging they seem to work, but when I go out on the road with the car I soon realize that the brakes are not working. I am sure that they work when I tighten them up and the question is: What is it that creeps in after I take the car out on the road? The car is a five-passenger light touring body and it gives good satisfaction excepting that it annoys me to think that I have no emergency brakes to fall back upon in a pinch. J. K.

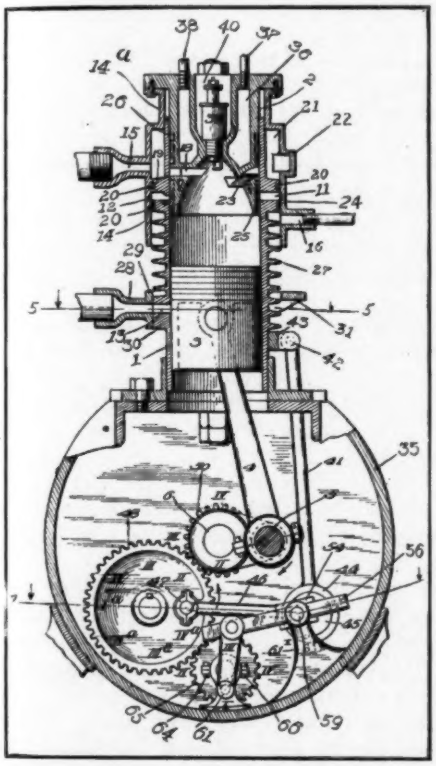


Fig. 3—Knight motor as shown in the original Patent Office drawing

Yonkers, N. Y.

The reason why the brakes do not work after the car is taken out on the road is that the adjustment is made when the tonneau is empty. The distance between the center of the rear axle and the point of fastening of the brakeshaft is too short. Tighten the brakes up so that they drag a little when the tonneau is empty and they will be free when the same is loaded down; another way is to adjust the brakes with the passengers in the tonneau. The real remedy lies in rebuilding the emergency brake system so as to increase the distances referred to. Fig. 5 is intended to show just what the trouble is, and why.

Looks Like Poor Distribution of Mixture

Editor THE AUTOMOBILE:

[2,373]—I have a 1909, 30-horsepower automobile that has caused me to awaken quite early in the morning. Cylinder No. 4 pops back and shoots out of the carbureter a portion of the charge. Have taken the machine to three shops, each of which stands high in its superior knowledge of gasoline engines, but have received no benefit. The cams have been examined; the valves set and polished, and the engine tested for a hidden crack, but all to no good. I have discovered by taking out the regular auto gasoline and putting in the tank 72 test that I can to a great extent overcome it, but it is not always convenient to use high-grade gasoline. Now, I notice that the manifold pipe is of a rather large size, and I also notice that the back end or the point farthest from the front cylinder is about three-eighths of an inch low, or the point where it is fastened to the cylinder No. 4 would have to be raised three-eighths of an inch to make it on a level. Now would gas drift faster to the higher end of the pipe, and would it have a tendency to form a pocket in the lower end of the manifold pipe? Should the manifold pipe be on a level when the machine is on level ground? T. J. BOSSERT.

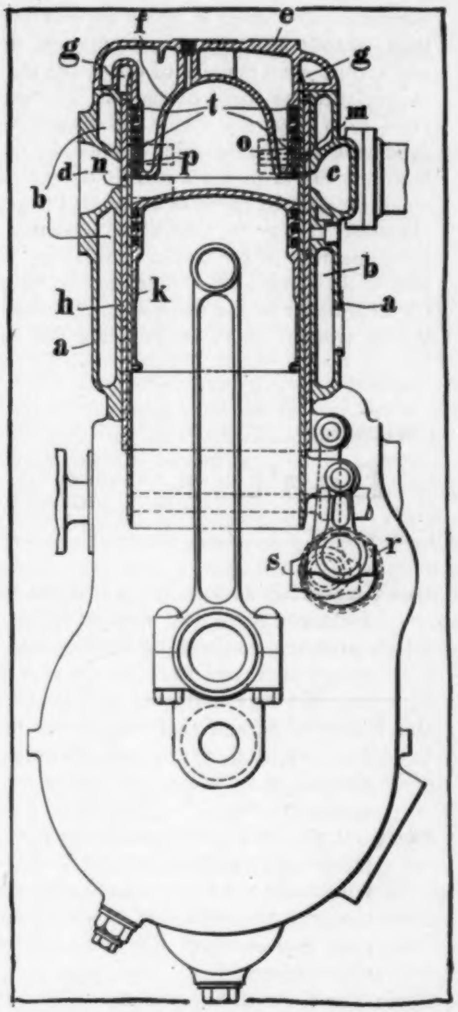


Fig. 4—Cross-section of the Knight motor as it was put into practice in the British Daimler plant

Hollywood, Cal.

Popping in the carbureter is due primarily to the fact that the speed of travel of the incoming mixture is below the speed at which the flame propagates in the same. When the mixture is ignited in the cylinder of a motor it burns with a certain speed depending upon the proportion of gasoline to air, and also to the amount of the compression, conditions of scavenging and tem-

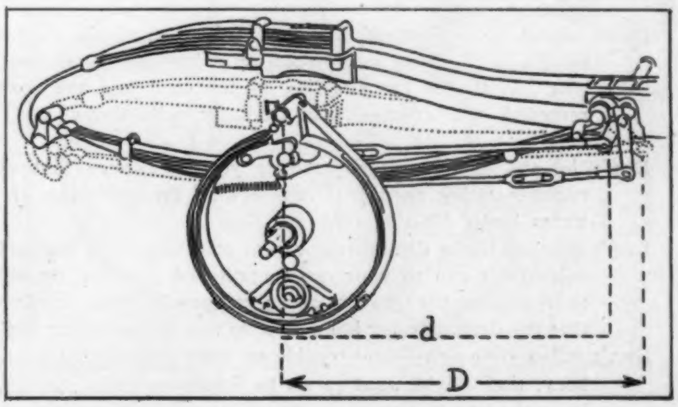


Fig. 5—Lever motion coupled up too short, so that brakes are thrown out of action when tonneau is loaded

perature. The speed at which the mixture passes through the intake depends first upon the depression, or difference in pressure, and second upon the size of the intake manifold. If the manifold is too large the speed of the gas will be so low, all other conditions fixed, that the flame will travel back into the carbureter, producing the phenomenon complained of. The way to overcome this difficulty is to use a manifold small enough in area to bring about the desired speed of travel of the gas in the direction of the cylinder. A way to reduce the tendency to this is to lower the inflammability of the mixture; this may be done by adding gasoline to the same. The latter may be accomplished by increasing the depression in the depression chamber of the carbureter, and this is brought about by reducing the quantity of auxiliary air admitted. But if the manifold is so designed that popping back takes place due to bad distribution, there are only two ways that we now think of for overcoming the trouble. The first remedy lies in the replacing of the defective manifold with one that is properly designed. The second remedy depends upon so timing the motor that there will be a definite lapse of time between the closing of the inlet and the opening of the exhaust valve. If the exhaust valve is closed 10 degrees after center, and the inlet valve is open 15 degrees after center, the difference represented by 5 degrees will be sufficient to overcome the trouble, it is believed. In addition to this timing remedy, it will be well to adjust the carbureter so that it will deliver a somewhat richer mixture than it does when popping occurs.

Don't

BEING STILL ANOTHER INSTALLMENT OF TERSELY-PUT ADVICE—THIS TIME DIRECTED TO THE PROSPECTIVE PURCHASER OF A CAR, AND THE READING OF WHICH MAY SAVE HIM TIME, TROUBLE AND MONEY

Don't make the mistake of examining every automobile manufactured if you only want to buy one.

Don't persuade yourself to believe that you can see so many things that you have no use for and then pick out the one idea that conforms with your needs.

Don't flatter yourself that you are so much smarter than anyone else as to permit you to enjoy many demonstrations and not have to pay for taking up the time of the many demonstrators.

Don't get the idea here that they will ask you for money; certainly not, but they will fill you so full of nonsense that you would not know a good automobile if it ran over you.

Don't measure the ability of an automobile based upon its high gear performance on a grade; it may be fitted out with a low gear ratio.

Don't decide as to the general ability of an automobile without observing its performance first on a level and then in hill-climbing work. If the car will travel fast on a level hard road and in addition to this quality has good hill-climbing ability, it is a sign of power and harmony.

Don't select the automobile that you are to pay good money for because it will go like the dickens on a billiard board or a boulevard; you might have to hire a horse to pull it up hill.

Don't figure out that the radiator is amply large for its intended purpose based upon your observation while the car is traveling fast; a good automobile can almost do without a radiator at the higher speed.

Don't forget that the ability of a radiator and the cooling system in general will best be brought out when a car is traveling on a long sandy road with the motor working at approximately full load and the sun beating down doing its prettiest.

Don't abandon the idea of finding out how good the cooling system is if a long sandy road on a hot day is not available. With the car standing at the curb and the spark retarded, the average poor radiator will throw up its hands.

Don't let the demonstrator persuade you to believe that the radiator is big enough if it offers all the evidences of a steam boiler blowing off.

Don't give up if the demonstrator who sold you a car was able to make it run to your satisfaction and you are not able to duplicate the performance; it merely goes to show that the demonstrator knew how to run the car—you don't.

Don't inflict your new-found trouble on your unprotected neighbors; they might want to go to Sunday-school. Anyway, if you persist in running your car on a retarded spark, the motor will overheat, but if you do not know what lubricating oil is for, the bearings will squeak. What you want is horse sense, not your neighbor's sympathy.

Don't race off to the sales agency and talk about being stuck after you buy a car and it fails to come up to your final expectation. Don't expect anything. Decide on what you want first, then buy the car.

Don't mistake a fine line of talk from an engaging salesman for chrome nickel steel in a crankshaft or other refinements in a car. Just keep in mind the fact that the salesman don't make the car.

Don't try to tell the maker of an automobile how to build it just because you want one. Put in your time finding the particular make that will do the work you have to perform.

Don't think you know more about it than the designer just because you read a technical paper; the paper may be barking up the wrong tree.

Don't overlook the fact that there are 360 degrees in a circle and a statement may be based upon the perspective as viewed from any one of these angles; this is the reason why a little knowledge is dangerous.

Don't jump to the conclusion that the cost of maintenance of a car will be low if the purchase price is high. The actual cost of maintenance is more likely to be in proportion to the square of the velocity of the car and substantially independent of the purchase price.

Don't buy a seven-passenger car before your family expands sufficiently to take up the reserved seats in the tonneau; your neighbors are mighty apt to fill the vacancies.

Don't imagine that an empty tonneau costs little or nothing; it is difficult to keep the rear wheels on the road when the car thrashes along at high speed under the influence of a heavy body that is not properly weighted down.

Don't forget that it is a costly expedient filling the tonneau even if it is the lesser of two evils.

Don't reach the conclusion that the carbureter is large enough for the intended purpose even if it does carburet at both high and low speeds. The carbureter might fail when the car is half-way up a long steep hill.

Don't assume anything. If the car you put your money in has no means for telling you how much lubricating oil there is in the crankcase, take all your chances in one direction only; keep putting in lubricating oil.

Don't use the Kentuckian's whiskey test as a means for determining the character of the lubricating oil you propose to use in your motor; it may look like oil, or it may smell like oil, and it might even taste like oil, but in spite of all these necessary qualifications it might act like trouble.

Don't experiment with lubricating oil; if the brand you are using proves to be efficacious it is your good friend—stick to your friends.

Kingston Carbureter

SECTIONAL ILLUSTRATION INDICATING RELATIONS OF PARTS: FLOAT IS CONCENTRIC; FLOATING BALLS METHOD OF REGULATING AUXILIARY AIR DEPICTED

JUST in proportion as the fuel problem becomes an issue, so does the problem of carburetion have to receive the attention that will bring the capability of the carbureter up to the more exacting requirement. There are other conditions that are slowly being recognized as of such influence that it will be to the point to discuss them and to try and form an estimate of their influence on the performance of motors and ultimately upon the automobile art.

As the number of automobiles in use increase, and the character of the skill of the owners thereof falls to lower levels, it is rendered more apparent to those who have to cope with the problems involved that greater effort must be made to simplify the equipment used, and by so doing compensate for the shortcomings of the users. That there is a falling off in skill, taking it under average conditions, is true, and this growing condition is ascribed to the fact that the major portion of the new additions to the ranks are men who know little or nothing about the mechanical problems involved in the make-up and maintenance of automobiles.

The time was when it seemed that the owners of automobiles would have to learn how to master the complex problems involved, but the whole situation was so much improved within the last few years that the real hope of betterment lies in another direction. Primarily, it would be a Herculean task to teach the better portion of 500,000 owners of automobiles how to do all the things that would have to be accomplished were it not for the improvements wrought, and the simplification of the automobile down to the level that makes it possible to place so complex a machine in the hands of the average man.

That carbureters represent much in the operation of a motor is a matter that is now well recognized, and in order to fully appreciate the questions of carburetion it will be necessary to digress a little and recount some of the more pressing demands. Taking the Kingston type of carbureter as the subject: using it to illustrate the points to be made, attention is called to Fig. 1, which is a section of the carbureter in which D is the primary air intake through which the initial air passes along to the depression chamber, by the nozzle, up to the mixing chamber above. The flow from the mixing chamber is impeded by the butterfly valve, and when the same is opened, the mixture flows past to C, which is the point of connection of the intake manifold, the same leading to the combustion chamber of the respective cylinders of the motor.

In the meantime the gasoline flows in through G into the float bowl when the float K lowers, there being a needle valve in the narrowed portion of the passageway, and as the depression is induced by the suction of the motor, the gasoline passes out of the float bowl to the nozzle. There is a needle valve A placed to alter the size of the nozzle and regulate the amount of gasoline that can pass out of the nozzle into the depression chamber under a given difference in pressure.

The mixture that is made by the flow of initial air past the nozzle in the depression chamber is too rich to be of service, and the next step in the process of carburetion is in the form of auxiliary air; this air is taken in through orifices, of which there are five; one of the orifices shows in section in Fig. 1 at L and the cover to the same is indicated as N at a point just over the ball. Referring to Fig. 8, the five covers over the same number of floating balls are indicated as B1, B2, B3, B4 and B5. In this figure the covers over the gasoline intake is indicated as G1.

In order that the reader will better understand the design and construction of the carbureter, reference will be had to reproductions of the carbureter. Fig. 4 shows the exterior of the carbureter looking at one side in which G1 is the gasoline intake, A2 is the fitting at the bottom for the primary intake, A1 indicates one of the auxiliary air intakes, and P1 is the mechanism for use in priming the motor if the occasion requires. Transferring the attention for the moment to Fig. 5, the letters of reference denote the following: A2 is the orifice of the primary air intake, B6 is the float bowl of the carbureter, G1 is the gasoline intake, A1 is one of the five orifices of the auxiliary intake, L1 is the lever placed to control the butterfly valve, and N1 is the exposed portion of the stem of the needle valve connected with the nozzle; this valve is manipulated by screwing it in to reduce the supply and out to increase the same. In order that the adjustment will stay permanent, a clamping screw is provided. Figs. 9 and 10 show several of the component parts of the carbureter and are offered for the purpose of acquainting the reader with the mechanical refinements that obtain in this work.

Necessities of the Occasion Discussed in Detail

If the reader can be brought to a good realization of the requirements and the methods in vogue for accomplishing them, the aim will have been accomplished. Take the needle valve for illustration: by referring to Fig. 2 the results obtained by manipulating the same will be understood. In this figure the ordinates read needle valve setting in degrees, and the abscissæ are plotted in terms of thermal efficiency. The particular motor was run at 1,000 revolutions per minute and the load was changed from 10 to 30 horsepower by 5-horsepower increments. The thermal efficiency was maximum when the least amount of gasoline was used, considering the delivery of the horsepower stated in each case. It will also be observed that the thermal

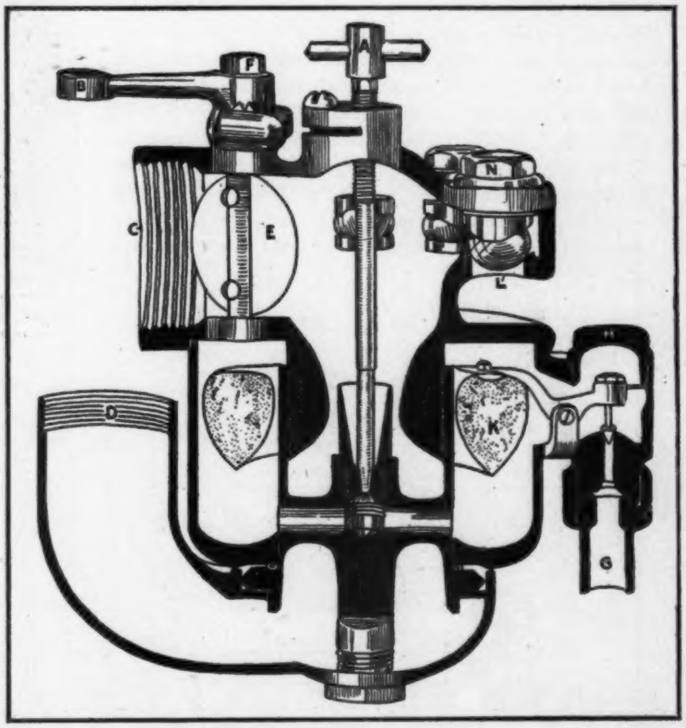


Fig. 1—Cross-section of the carbureter showing the primary intake, needle in the nozzle, floating balls, concentric float in the bowl, and method of adjustment

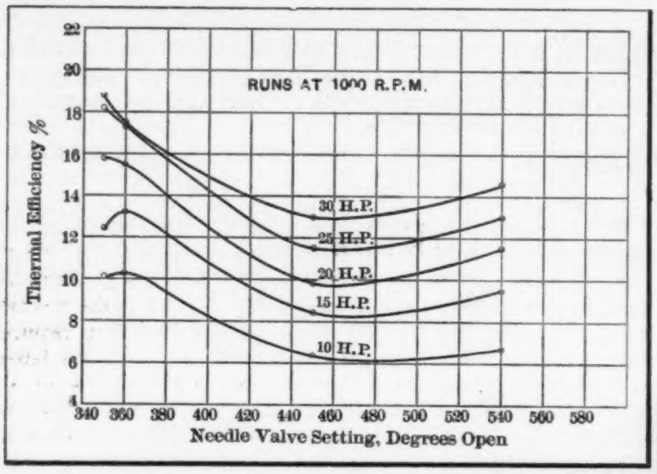


Fig. 2—Chart designed to tell the thermal efficiency of a motor running at different powers and a constant speed for several settings of the needle

efficiency was maximum at maximum loading of the motor.

The thermal efficiency for different loadings, at a constant speed and with 350 degrees of nozzle opening, according to the chart, may be repeated as follows:

THERMAL EFFICIENCY FOR DIFFERENT LOADS AT A CONSTANT SPEED

Horsepower with Nozzle at 350 Degrees Open	Thermal Efficiency in Per Cent.
10	10
15	12.3
20	15.89
25	18.12
30	18.83

The curves plotted for each horsepower output show a decreasing thermal efficiency as the nozzle is opened more, and in every instance the efficiency falls off rapidly as the quantity of gasoline is increased, which is what happens if the nozzle is opened more. One more point and this part of the subject will be passed: as the flow of gasoline is increased beyond a certain point, the thermal efficiency increases perceptibly, but the amount of this increase is not sufficient to be of any avail in every-day work; the best position of the nozzle is that which will afford the highest thermal efficiency, but the reason underlying this fact is not merely on account of the saving in gasoline that will be effected. It will be understood that gasoline, if it is fed into the cylinders of the motor in liquid form, and in excess, will "coke," and the serious trouble that follows the deposits of carbon over the combustion chamber surfaces will then have to be coped with. It is proper, therefore, to limit the flow of gasoline to that amount that will afford the highest thermal efficiency, independently of the fact that a little more might be obtained from the motor by enriching the fuel.

Referring to Fig. 3, another phase of this story will be recognized. In this chart the ordinates are plotted in terms of "pounds of gasoline per 1,000 revolutions of the motor" and abscissæ are plotted in terms of "thermal efficiency." In this case the speed of the motor was maintained at 1,250 revolutions per minute, and the needle valve was adjusted to 350, 360, 540 and 550 degrees; a run was made for each of these adjustments and the thermal efficiency was noted in each single instance.

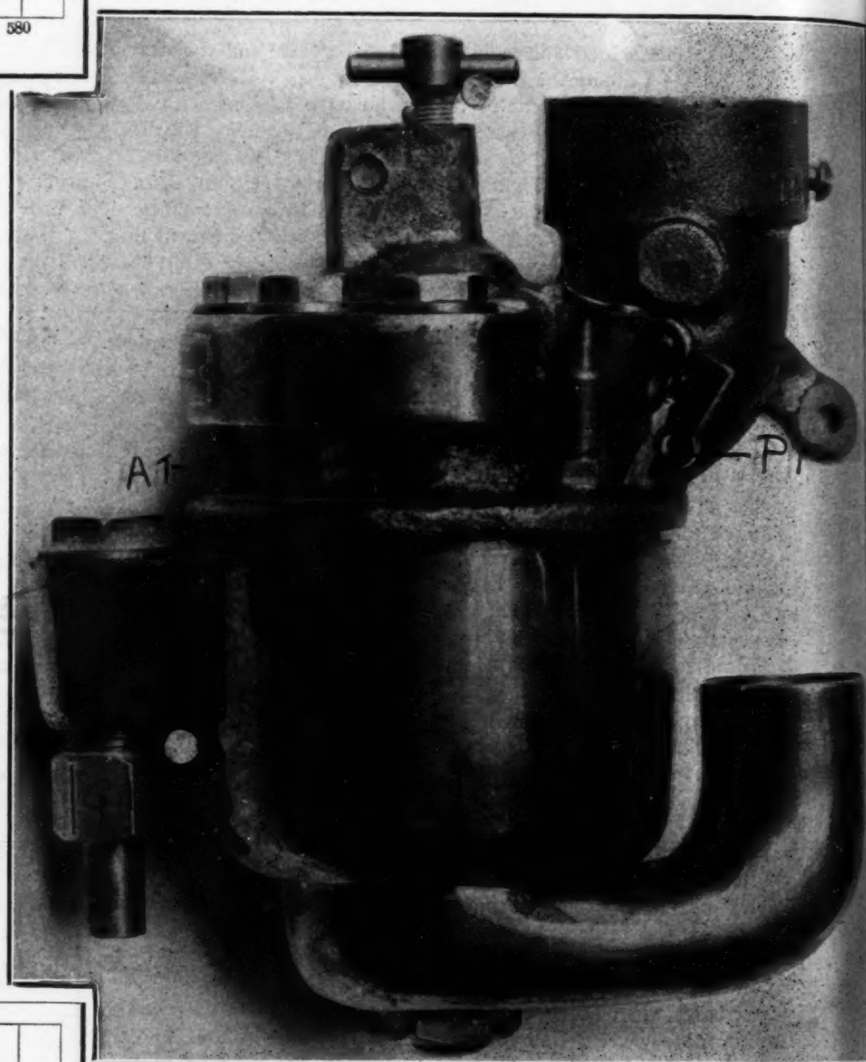


Fig. 4—Illustration of one side of the carbureter, showing the location of the priming mechanism

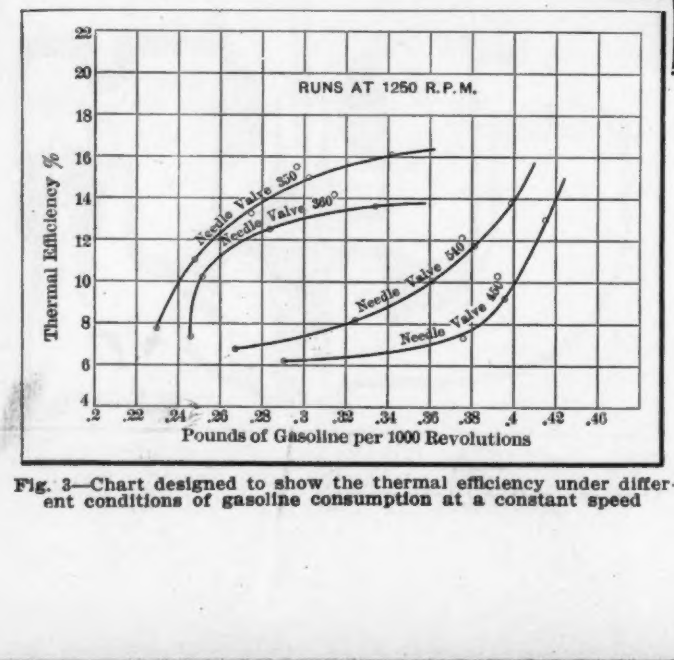


Fig. 3—Chart designed to show the thermal efficiency under different conditions of gasoline consumption at a constant speed

The highest thermal efficiency was realized with the closest adjustment of the needle, *i. e.*, 350 degrees; this is as it should be, according to the information obtained in Fig. 2. With this close adjustment, the thermal efficiency was below 8 per cent. with the lowest power taken from the motor, and slightly above 16 per cent. with the highest register of power. The gasoline consumption of the motor advanced from 0.228 pounds per 1,000 revolutions with the lowest power, to 0.34 pounds of gasoline per 1,000 revolutions when the motor was delivering maximum power. This shows that the increase in gasoline that is necessary for good performance may be expected to take place automatically within limits. The second curve, with the needle turned to 360 degrees, shows that the thermal efficiency in-

creases rapidly at first, but falls away, never reaching the level that obtains with the nozzle turned to 350 degrees. This performance offers a bare insight into the fact that if the motor is to operate at low power, slightly more gasoline will be worth considering, but under the conditions that obtain in automobile work, flexibility and a wide range of performance are assets that cannot be disregarded. Glancing at the curve with the needle turned to 540 degrees, it presents the astonishing condition which is represented by a reversal of the curvature as compared with the curvature when the nozzle is turned to a maximum of 360 degrees. The 450 degree position of the needle valve is the worst of all. This is further evidence of the fact that carbureters are very prone to dead points in their performance, and how to eliminate these dead points is one of the

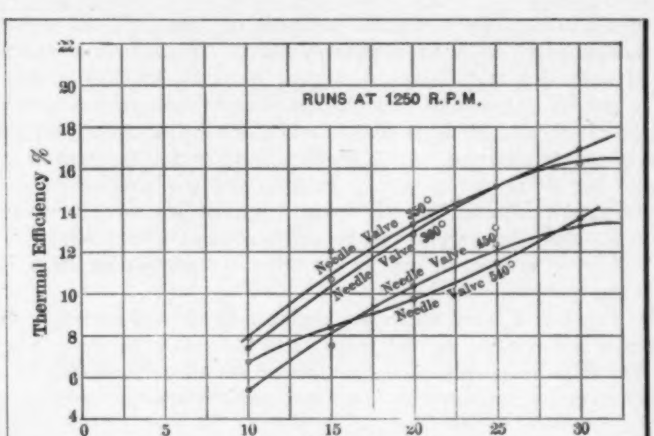


Fig. 6—Chart constructed to show the thermal efficiency for different needle valve settings and varying power with the motor running at a constant speed

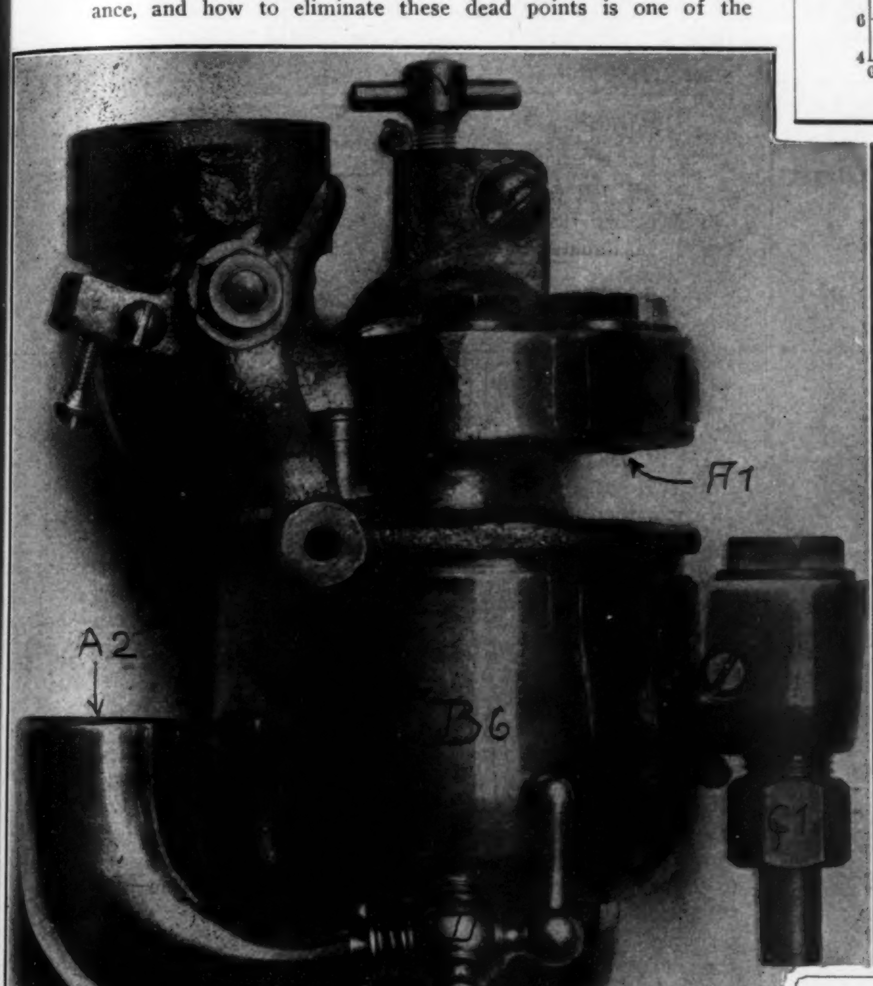


Fig. 5—Illustrating the other side of the carbureter and the location of the butterfly valve lever, draincock, and needle valve adjustment

serious problems to be coped with by makers and autoists.

Referring to Fig. 6, which is a chart designed to show the thermal efficiency and delivered horsepower when the motor is running at 1250 revolutions per minute, and the needle valve is given positions represented by 350, 360, 450, and 540 degrees of opening, this chart is corroborative of the information afforded in the charts Figs. 2 and 3. In this case the horsepower is plotted as ordinates and the thermal efficiency is given value as abscissa. Here again it is indicated that the highest thermal efficiency comes with the needle valve given the least opening, *i. e.*, 350 degrees. It is also shown that the thermal efficiency is lowest when the horsepower output is lowest, and at 350 degrees opening of the needle, the following is approximately true:

HORSEPOWER AND THERMAL EFFICIENCY AT A CONSTANT SPEED

Delivered Horsepower at 1250 Rev. Per Minute	Thermal Efficiency in Per Cent.
10	8
15	10.45
20	13.56
25	15.2
30	16.21

An examination of the curve plotted for 360 degrees shows that the thermal efficiency is lower at all ratings up to 25 horsepower. Beyond 25 horsepower the slightly increased flow of gasoline adds somewhat to the thermal efficiency; the difference is not great, however. It is only when the needle valve is given a twist of 450 degrees that the thermal efficiency falls off considerably, and the 540 degree position of the needle valve affords varying results interlaced with the 450 degree position.

At all events, a study of these charts shows the interrelations of power, speed, and thermal efficiency, and points the way to proper carburetion. It is obvious that the auxiliary air control must be in precise accord with the requirements as measured by the flow of gasoline if the mixture is to be efficacious for the purpose. It is recognized that the amount of energy which will be taken into the cylinder of a motor is in direct proportion to the weight of gasoline sucked in, but this in itself is of

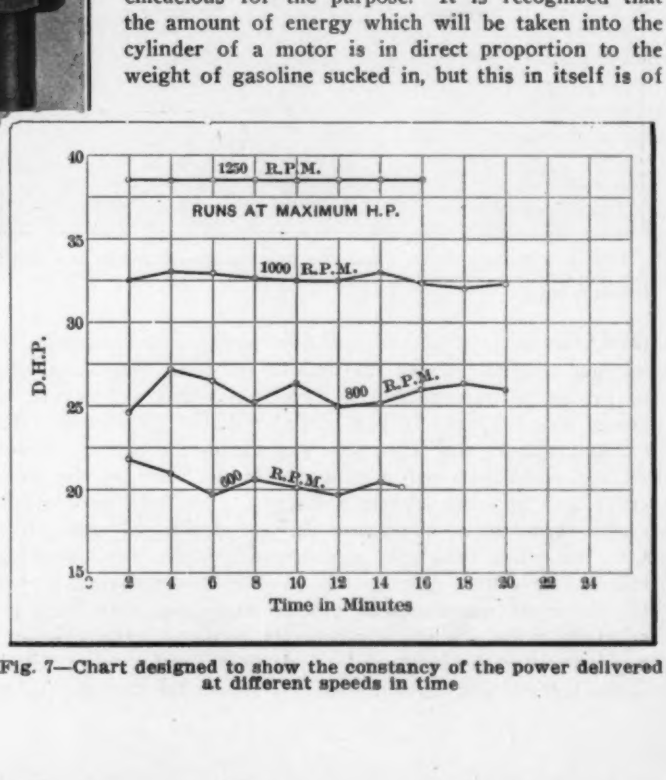


Fig. 7—Chart designed to show the constancy of the power delivered at different speeds in time

small avail. The energy must not only be taken into the cylinder but it must be in an acceptable form. To be in this form it is necessary that 8,000 volumes of air shall have intermingled with it one volume of (liquid) gasoline, the same to be vaporized, and so thoroughly intermingled with the air that during the process of combustion each molecule of hydrogen or carbon will be introduced to its affinity, oxygen, and the products of combustion resulting will be in the form of water and carbonic acid plus the regular quota of nitrogen, in the absence of unburned carbon, or any of the other compounds having a fuel value.

Fig. 7 is a chart which was designed to show the performance of a motor at the various speeds, and the variations in the horsepower at the speeds, also the effect of the malperformance of the carbureter, ignition, etc. At 1250 revolutions per minute the

Fig. 8—Looking down upon the carbureter, showing the orifice for connecting the intake manifold and the caps covering the floating balls

particular motor delivered 37.6 horsepower uninterruptedly and without variation during the time of the test. When the speed of the motor was dropped to 1,000 revolutions per minute, the power was substantially 32.5 horsepower, but there were a few variations above and below this level during the time of the test. At 800 revolutions per minute, the lowest point in the power curve was 24.5, the highest point 27.2, and there were considerable variations in the power delivery during the time of the test; but when the speed was dropped to 600 revolutions per minute, the lowest delivery was slightly under 20 horsepower; the maximum was about 22, but the variations were sharp and relatively wide. When a carbureter is doing exactly what is required from the best point of view, the performance will be in the form of a straight line as here shown for 1250 revolutions

Fig. 9—To the left the primary intake casting, to the right the float chamber, with the concentric float in position

per minute, but when the carbureter falls below this fitting requirement and reaches the level as here indicated at 600 revolutions per minute, flexibility and range are scarcely normal expectations.

Since it is admitted that the difficulties involved in fixing the flow of gasoline out of a nozzle are few and readily coped with through the good office of a needle valve or in other suitable ways, the troubles which bring on lack of flexibility and crankiness of performance must be due to lack of proper proportion of the interrelating functional members.

The particular point involved in the construction of this carbureter that has to do with the softening of the performance and the smoothing out of the variables, is wrapped up in the plan of employing bronze spheres to obstruct the flow of auxiliary air, excepting in so far as the spheres are lifted by suction, and the air flows in through the openings thus afforded, under the impetus of a difference in pressure as represented by the depression within the mixing chamber overcome by the atmospheric pressure of 14.7 pounds per square inch.

These balls are prevented from departing from their position of vantage by the plugs in Fig. 1, which have concave ends conforming to the curvature of the spheres and which are screwed down so closely that the spheres are permitted to lift off of the seat a predetermined distance. The spheres are regulated as to weight by selecting materials of the right specific gravity, so that they lift when the depression is so regulated as to demand the presence of auxiliary air. The five spheres are of one diameter, and as the material is the same in each of them, and of same weight, they do not lift simultaneously under a given depression because they do not all occupy positions of vantage in the stream of inrushing primary air, hence there is

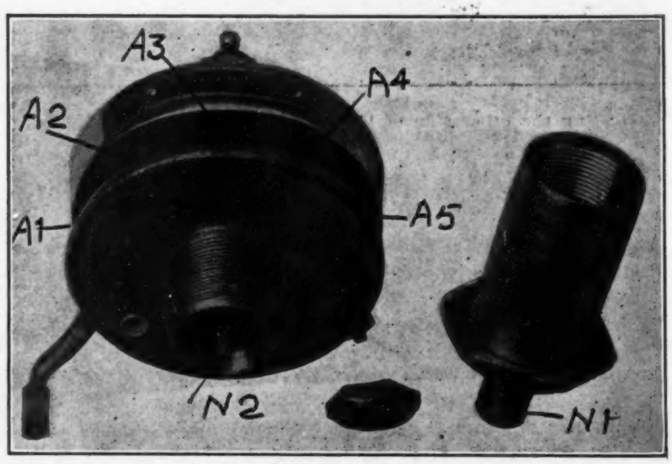


Fig. 10—To the left, showing the floating ball housing and the method of connecting the same to the lower half; to the right, the accommodation casting by means of which the two parts are joined

a variation in the depression, considering it locally, sufficient to permit of taking advantage of a difference in the time of the lifting of the several balls, so that great flexibility of the motor performance is to be relied upon, and finally it is worth while remembering that the balls are constant as to weight, cannot vary in the amount of the lift and are free from any mechanical incongruity such as would tend to alter their ability to function in service, as the result of wear, atmospheric conditions, or changed environment. It is claimed, therefore, for this type of carbureter, that having fixed the proper sizes of the balls, the right number, and the position that they should occupy, on a laboratory basis, the experimental phase of this situation is done for on a basis of finality, leaving nothing for the automobilist to adjust in practice, excepting to coax his motor up to its right performance by altering the flow of mixture from the carbureter through the combustion chamber, by changing the position of the butterfly valve E, Fig. 1, which is a matter of altering the angular position of the lever B, the same to be connected up with an accelerator pedal which may be located at a convenient point.

G. & A. Carbureter

DESCRIPTION OF AN AUTOMATIC ADJUSTMENTLESS CARBURETER OF FRENCH DESIGN WHICH IS BASED ON THE PRINCIPLE OF THE VENTURI TUBE

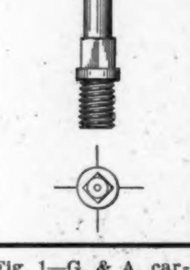


Fig. 1—G. & A. carbureter jet

IT has been the aim of designers of carbureters to evolve something that is entirely automatic, requiring no adjustment whatsoever, consequently having nothing to get out of order.

Messrs. Grouvelle & Arquembourg, of Paris, have for many years been gaining a reputation with their carbureter on famous racing cars, and for this reason they have made a more careful and scientific study of this matter. In fact, these studies date back to the very early days of the automobile. Their experiments have been thorough and extensive. In all this time data has been collected and tabulated on carbureters of several of the most successful cars, until to-day the product of all this experience is a carbureter without an adjustment.

Grouvelle & Arquembourg were among the first to manufacture radiators for the different well-known cars, such as Panhard, Mors, Darracq, etc. The distinctive features of their carbureter are the shape of the choke tube, the ball cage air valve and position of the jet.

The Venturi tube, which is the basic principle of the carbureter under discussion, derives its name from an Italian physicist who became known in 1791. Experiments show that Venturi invented nothing, but rather controlled a fact known to the Romans. A concession of water in ancient Rome was given according to the diameter of pipe and was so charged for, but the defrauder, to increase the amount of water supply, placed a cone in the outlet. Venturi in his book on Industrial Physics says that the supply of air through an outlet is made of two cones, one convergent of 30 degrees and the other divergent of 7 degrees; then the quantity of air going out is four times greater than if the outlet was plain.

Piston displacement was taken as a basis from which all calculations were made, and although many criticisms may be offered for using this as a starting point, the contentions to the contrary are as follows:

It has been shown by many eminent engineers, and notably by Arnoux in France, that piston speeds have practically reached an upper limit; in other words, that piston speed and maximum power are the same, regardless of the stroke. It is, therefore, very reasonable that piston displacement should be taken as a basis, for in ordinary practice it is the displacement of the piston in the main which determines the gas speeds in the carbureter passages.

It has been shown that when any fluid passes through a pipe of variable section the quantity passing any given section in a given time is the same; such being the case, the velocity of the fluid in the various sections is inversely proportional to the areas of the sections. Hence, it is evident from the foregoing considerations that the pressure is greatest at the largest section and least in the smaller. A practical application of this principle was made in the construction of the Herschel-Venturi water meter, and in later years this principle has been applied to the curbureter design.

To thoroughly understand the principle and appreciate the advantages of the Venturi tube in the carbureter design we will consider Fig. 6. The form of discharge tube here shown is interesting in that the discharge is greatly increased in the addition of the divergent nozzle at the outlet end, for it is found that the velocity of flow in the throat at (a) is greater than that produced by the head (h). When a pressure gauge is placed at (a) the pressure is found to be less than atmospheric; in fact the fluid is discharging into a partial vacuum, and the velocity at (a) is due to head (h), plus the head due to the vacuum.

An interesting experiment, which shows this phenomenon very strikingly, may be made by taking a glass tube three-quarters of an inch bore, and drawing it to a gradual waist of about one-twentieth of an inch diameter at the center. It is found that when water is forced through the tube at high velocity the pressure is so reduced at the waist that the water boils and hisses loudly—a phenomenon heretofore observed under certain circumstances in the action of carbureters, but one which has not been satisfactorily explained before, as far as can be learned.

In a case that came under observation when a Venturi car-

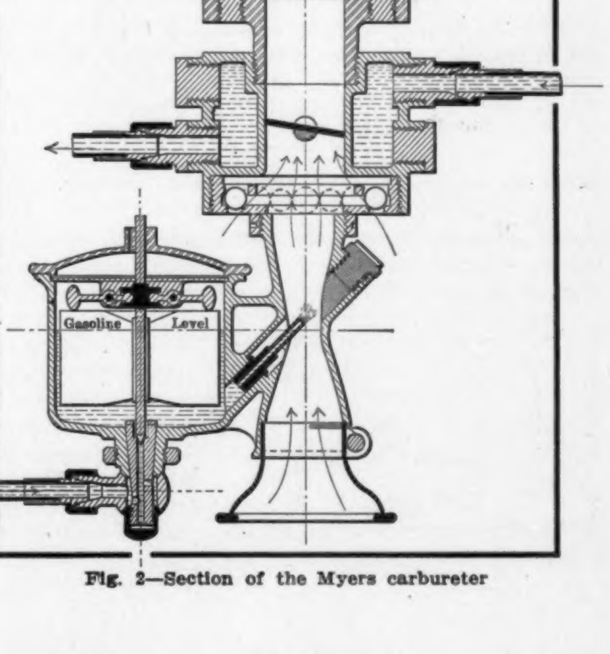


Fig. 2—Section of the Myers carbureter

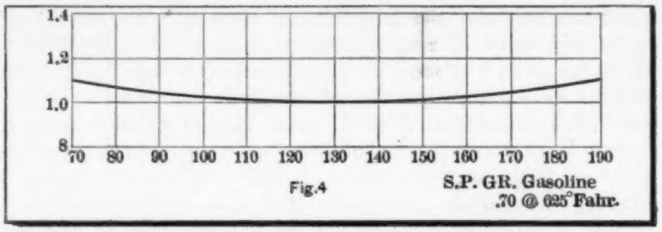


Fig. 3—Diagram showing gasoline consumption in relation to temperature of carbureter jacket

bureter was being tested the hissing was so loud as to be disagreeable. By making the "upstream" end smaller, thereby decreasing the ratio of upstream area to the throat area, the hissing practically ceased. Of interest is the fact that the gasoline in the Venturi throat is actually undergoing ebullition at reduced atmospheric pressure, and this is one of the many causes operating to effect homogeneity of mixture.

The employment of the Venturi possesses the following important advantages: Homogeneity of mixture, as explained above; reduction of wire drawing to minimum; compactness; light weight; ease with which the mixing chamber may be jacketed by water; mixing chamber may be placed in any plane, thus adapting it to any motor design, no adjustable or movable parts.

Mathematical Considerations Regarding the Flow of Fluids in a Venturi tube.

If we consider that there exists a certain pressure head, say "h," causing a flow of liquid in the Venturi tube, it will be seen from Fig. 9 that the principles stated above regarding the flow of a fluid in a tube having various cross-sections A and A^2 that at (1) the pressure head is

$$h1 = \frac{V1^2}{2g}$$

and at (2) the pressure head is

$$h2 = \frac{V2^2}{2g}$$

It is clear then that the loss of head between (1) and (2) or the head on the Venturi is given by

$$h = h2 - h1$$
$$= \frac{V2^2}{2g} - \frac{V1^2}{2g}$$
$$= \frac{V2^2 - V1^2}{2g}$$

It will be recalled that the velocities in the different sections are inverse to the areas of these cross-sections; hence we have

$$V2 = \frac{A1}{\sqrt{A1^2 - A2^2}} \times \sqrt{2gH}.$$

While the velocity of the upstream end of the tube is given by

$$V_1 = \frac{A_2}{A_1} V2, \text{ and } V_1^2 = \frac{A_2^2}{A_1^2} V_2^2.$$

Now

$$H = \frac{V_2^2 - \frac{A_2^2}{A_1^2} V_2^2}{2g}$$

$$= \frac{\left(1 - \frac{A_2^2}{A_1^2}\right) V_2^2}{2g}$$

$$= \frac{\frac{A_1^2 - A_2^2}{A_1^2} V_2^2}{2g};$$

hence

$$V_2^2 = \frac{2ghA_1^2}{A_1^2 - A_2^2},$$

from which we find that the velocity at the throat is given by

$$V_2 = \frac{A_1}{\sqrt{A_1^2 - A_2^2}} \sqrt{2gH}.$$

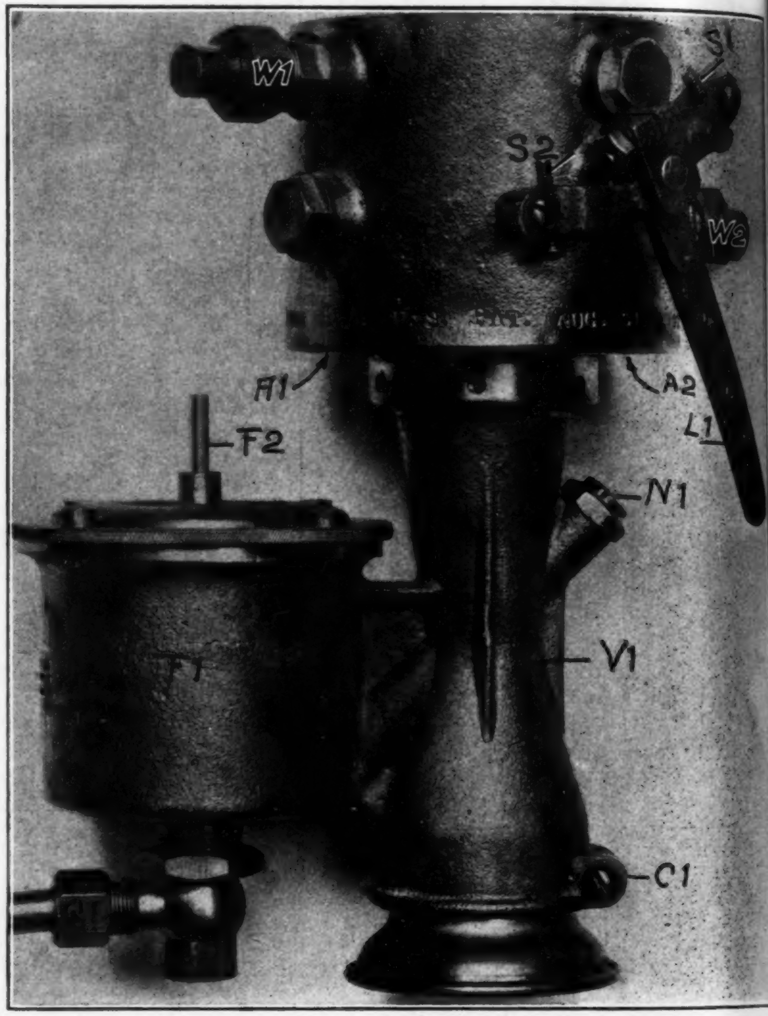


Fig. 4—Throttle side of G. & A. carbureter: S1, adjusting screw for open position of throttle; S2, adjusting screw for closed position of throttle; W1, outlet for water circulation round water jacket; W2, inlet for water circulation round water jacket; A1, ball valves for supplementary air at high speeds; A2, ball valves for supplementary air at high speeds; L1, lever operating throttle; N1, spray cone, which can be removed to take out jet; S, brass cove with gauze-covered bottom; C1, release screw for same; F1, float chamber; F2, needle valve; G1, gasoline intake.

$$\text{Throat ratio} = \frac{A_2}{A_1}.$$

The throat ratio for G. & A. carbureters has been taken as 1:4; we then have

$$\frac{A_1}{\sqrt{A_1^2 - A_2^2}} = \frac{4}{\sqrt{4^2 - 1^2}} = \frac{4}{\sqrt{15}} = 1.0328.$$

Hence

$$V_2 = 1.0328 \sqrt{2gH}.$$

From this expression we have

$$V_2^2 = \frac{2ghA_1^2}{A_1^2 - A_2^2} = \frac{2gh}{\frac{A_1^2 - A_2^2}{A_1^2}} = \frac{2gh}{1 - \frac{A_2^2}{A_1^2}}$$

$$= \frac{\frac{2gh}{1 - A_2^2}}{A_1^2}$$

and

$$2gH = V_2^2 - \frac{A_2^2}{A_1^2} V_2^2.$$

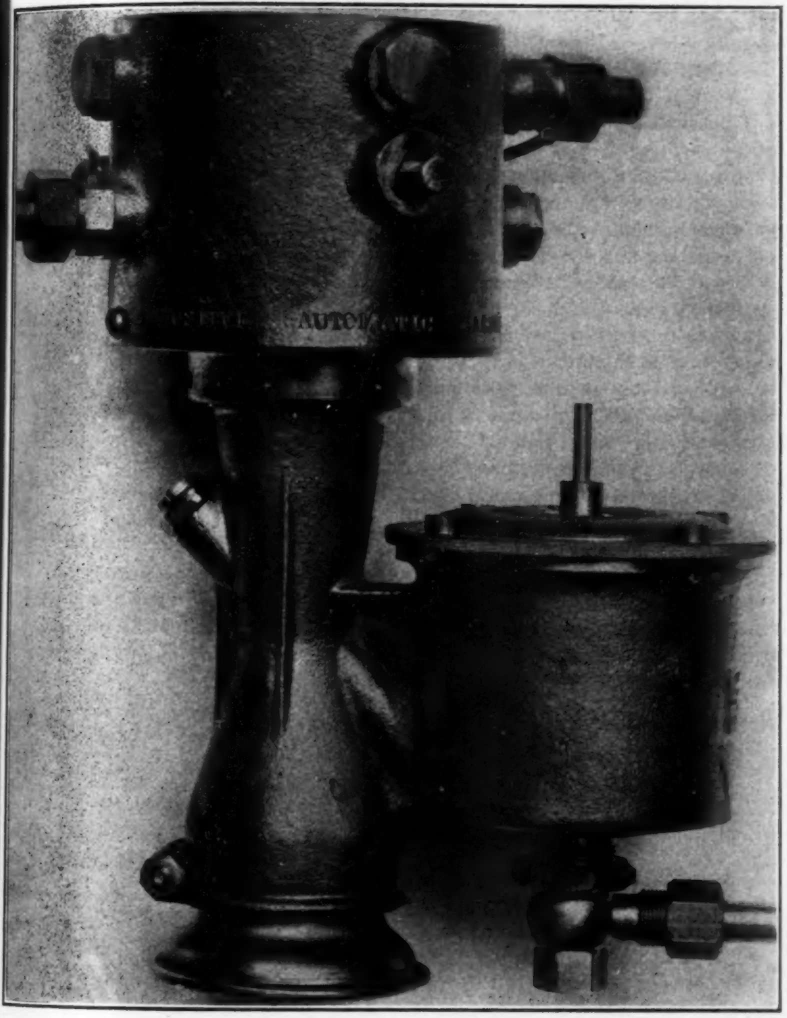


Fig. 5—Opposite side of G. & A. automatic carbureter

hence

$$V_2^2 = 2gH + \frac{A_2^2}{A_1^2} V_2^2$$

$$= 2gH + V_1^2$$

$$= 2g\left(H + \frac{V_1^2}{2g}\right)$$

and

$$V_2 = \sqrt{2g\left(H + \frac{V_1^2}{2g}\right)}$$

Thus it is seen that the velocity at the throat will be that corresponding to the head on the Venturi plus the head corresponding to the velocity of approach in (1). By velocity of approach

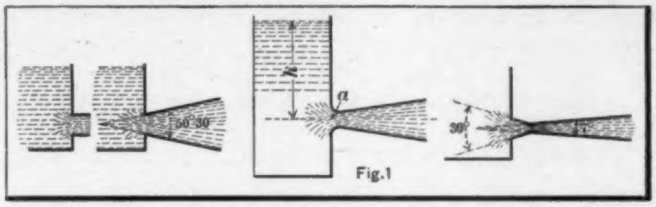


Fig. 6—Example of discharge tube with convergent cones

we mean the additional velocity gained by the moving liquid prior to reaching the throat. From measurements made upon carbureters which give very good speed torque characteristics, the following formulæ for the design of the Venturi are derived.

Referring to Fig. 7—

Let V = piston displacement in cubic centimeters,
d_1 = diameter in centimeters of Venturi throat,
d_2 = diameter in centimeters of Venturi facing upstream,
d_3 = diameter in centimeters of Venturi facing downstream,
A_1 = area in square millimeters of Venturi facing upstream,
A_2 = area in square millimeters of Venturi throat,
A_3 = area in square millimeters of Venturi facing downstream,
L = over all length in centimeters,
t = thickness of tube in millimeters; then the following formulæ give excellent results:

$$\frac{V}{A_2} = 496$$

$$A_2 = \frac{V}{496}$$

$$d_2 = \sqrt{a_2} \times 1.128$$

$$d_1 = \sqrt{a_2} \times 2.584$$

$$d_3 = d_1 - .5\text{cm.}$$

$$A_1 = A_2 \times 5.42$$

$$L = 6.05 \times d_2$$

$$t = 1.5 \text{ to } 2.5 \text{ m/m}$$

Heat Jacketed Carbureters

From tests that have been carried out it seems that the fuel consumption decreased with an increase of jacket temperature for a given output, but only up to a certain point, after which an increase was observed. The most effective temperature seems to be about 110 deg. Fahr.

During these tests it was incidentally found that in order to keep the Venturi tube of the carbureter at 110 deg. Fahr, supplying mixture to a motor of 100 m/m (3.93 in.) x 112 m/m (4.40 in.) it required an expenditure of 45.5 B.T.U. per minute, or approximately 1 horsepower. The motor ran at 1300 revolutions per minute and consumed 1.1 pints of gasoline per horsepower-per hour. Water jacketing the carbureter is, therefore, instrumental in effecting fuel economy and doing a portion of the work of the radiator. The results of these tests are shown in Fig. 3.

Calculation of Spray Nozzle Orifice

It was at one time thought that the size of the orifice in the spray nozzle could not be calculated, except by a lengthy process of trial and error, but observation of the orifices having the same shape proved that these may be calculated when the Venturi or throat area was determined.

When we deal with a gaseous combustible the determinations of the sections for air and combustible to pass weights of materials in proper

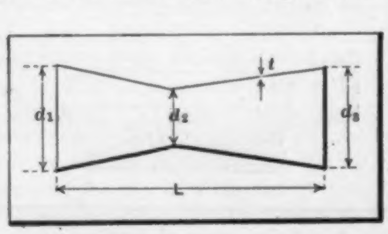


Fig. 7—Diagram of Venturi tube

proportion are given by the following equation, according to Krebs:

$$C = \frac{s\Delta\sqrt{2gH\dfrac{D}{\Delta}}}{sd\sqrt{2gH\dfrac{D}{d}}}$$

and simplifying

$$C = \frac{s\Delta}{sd}\sqrt{\frac{d}{\Delta}}$$

where

D = density of water,
Δ = density of air,
d = density of combustible,
S = section or area for entrance of air,
s = section or area for entrance of combustible,
H = pressure in millimeters of water,

the ratio between the two areas remains constant, no matter what vacuum is produced by the motor. When, however, the combustible is in the form of a liquid experience shows that the flow of liquid does not follow the air flow, and certain corrective factors must be introduced due to

(a) Differences in level existing between liquid in float and that in the nozzle,

(b) The necessary effort required to overcome the capillary attraction between liquid and nozzle, including the surface tension.

It has been found that when using the Venturi form of mixing chamber and a nozzle having the shape and outside dimensions shown in Fig. 1, the area of the Venturi throat and the nozzle orifice area are connected by the following relation:

$$\frac{S}{s} = 159.$$

Where $S = A_2$,
s = spray jet orifice area.

It is now easy to calculate the size of the spray nozzle orifice by the equation:

$$Sd = \sqrt{s \times 1.128} \text{ in m/m},$$

where Sd = diameter of the orifice.

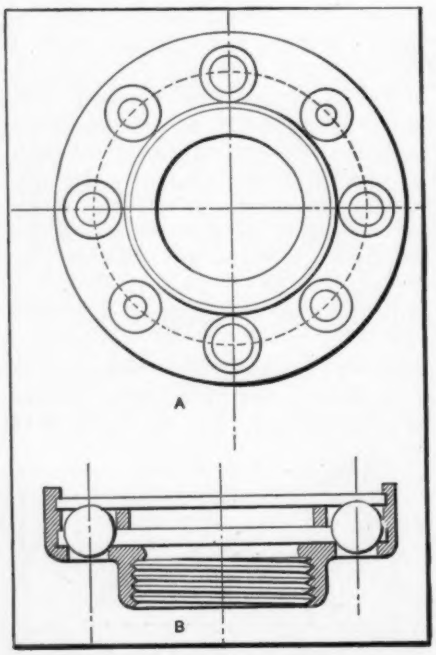


Fig. 8—(a) Top view of supplementary air intake; (b) side view of same

If the shape shown in Fig. 1 is deviated from, the above formula does not apply, for experiments show that the discharge coefficient varies with the shape and size of the nozzle; indeed, recent experiments made show that the discharge coefficient varies also with the variation in bore when the head is constant; this might be expected, since the effect of surface tension and wall friction is smaller in larger nozzles.

The exact size of the spray nozzle orifice also depends on the fitting and workmanship of each motor, as imperfections in igniters, pistons, valve stems, etc., introduce leaks which have to be taken care of by using a little larger jet.

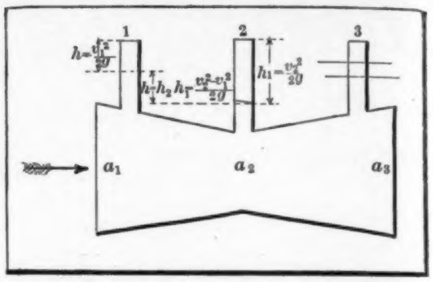


Fig. 9—Venturi tube with various cross-sections

The jet on the G. & A. carbureter can be very easily taken out by undoing the nut N1 (Fig. 4) and using a special tube wrench supplied with the car. It will be noticed that the jet is placed obliquely (Fig. 2), the gasoline atomizing in a conical shape in the smallest part of the tube where the suction is greatest.

Calculation of Size of Supplementary Air Ports

The flow of liquid from the spray nozzle orifice does not follow the air flow; in fact, as the speed of the motor increases, the liquid from the jet, in virtue of its inertia, flows more nearly in uniform stream, and means must be taken to vary this flow.

In practice it is comparatively simple to control the liquid flow by altering the vacuum or suction by causing an additional air supply at the downstream end.

It will be noticed in Figs. 8a and 8b that the auxiliary air is controlled by a series of bronze balls in a cage placed at the downstream end. These bronze balls are of various sizes and weights, and the ports also vary in diameter. Thus it will readily be seen that the bronze balls will lift successively and progressively, allowing the pressure at the upstream end to be relieved. Each ball has been calculated to the resistance of the port which it controls. Thus it has all the characteristics of the spring valve, but never varying in any change of temperature, giving also a positive mixture at any speed of the motor. This action also answers the purpose of a mechanical turbine.

The suction caused around the nozzle of the carbureter may be kept within the limits necessary to produce a uniform combustible mixture at all speeds by supplying auxiliary air through ports, the areas of which are determined from the equation developed by Krebs. The equation is as follows:

$$S = sC\sqrt{\frac{d}{\Delta}}\sqrt{\frac{H-h}{H}} - A_2.$$

Where Δ is the density of air,
d is the density of combustible,
S is the total auxiliary air area,
s = area of spray nozzle orifice,
H = depression produced by aspiration of motor,
A_2 = Venturi throat area,
h = a factor depending on the difference in level which exists between the liquid in the float chamber and nozzle; also on the necessary effort to overcome the capillary attraction of the nozzle.

A. J. Myers (Inc.), of 244 West Forty-ninth street, manufacture the G. & A. carbureter in New York City, and have delivered several for submarine work. From tests carried out with several 250-horsepower motors it is possible with the G. & A. to run as slow as 90 revolutions per minute and as high as 1,200 revolutions per minute. These submarines are fitted with Jencick motors having eight cylinders of 7-inch bore and 8-inch stroke; the size of the interior of the G. & A. used is 4 inches. Twenty-six of these have been ordered for the United States Government.

Protect the Magneto and Save Trouble

Always keep the magneto covered with a leather or vulcanite protector as it will exclude dust and flies and rain that find their way to this valuable part of the car equipment.

Digest

EXTRACTS ON TECHNICAL LINES FROM FIFTY FOREIGN PAPERS—DEVELOPMENT OF THE ELECTRIC FURNACE WITH "WHITE COAL"—SAVING IN TIRE MAINTENANCE—CAUSE OF REFINEMENT OF STEEL—SPREAD OF AUTOGENOUS WELDING

"White coal" and the electric furnace are entering into combinations in Europe which are attracting great attention the technical world and seem to have a tendency to wipe out the national boundaries of important industries, causing them to move to wherever the desired combinations of "white coal" and shipping facilities may be obtained in most liberal measure. The coast of Norway, where countless millions of horsepowers are stored in rapid rivers in the immediate vicinity of deep water ports which are open practically all the year round, seems to be the most favored locality and bids fair to become the seat of industries rivaling or exceeding in magnitude those clustered around Niagara Falls. With the electric furnace applied to steel making and with iron ore of excellent qualities available from Swedish and Norwegian mines, the outlook offers food for reflection also among automobile manufacturers. The manufacture of nitrates used for fertilizing purposes and of nitric acid is one of the new industries located largely in this region, though two large companies have been formed to work on the same general plan at Johannesburg, South Africa, and an Austrian company located at Patsch, near Innsbruck, has parted with rights under its patents to the French company, "La Nitrogène" which contemplates another large installation of this industry, also with water-power, in France. Briefly, the industry consists in robbing the atmosphere of its nitrogen by means of an electric arc furnace which shatters the air into its constituent parts. The Norwegian Nitrogen Company, capitalized at 41 million francs, uses for this purpose 40,000 horsepower taken from the waterfall Svaelgfos at Notodden, Norway, and 15,000 horsepower from Lienfos, another cataract near by. The company's latest public statement shows that a large profit has been earned almost since the inception of the work in 1908, and the company has now taken over a larger waterfall called Rjukan and is arranging to utilize 220,000 horsepower from this source for the German chemical factories of Saaheim. It has also acquired Wamma, Matre and Tyrin, three other "white coal" supplies, and in 1914 will have 500,000 horsepower near tidewater to offer manufacturers at a price of about $40 per horsepower per year. The cost to the Norwegian company is said to be less than $8. The method developed by Birkeland and Eyde for taking nitrogen from the air is of general interest, inasmuch as the heat of an electric arc is applied to a large surface. To this end, two electrodes, consisting of water-cooled copper tubes with closed ends, are placed in a horizontal plane and an arc is produced between them by a 5,000-volt alternating current. At right angles with the electrodes in the same horizontal plane there is placed an electromagnet excited from direct current. The electromagnet deviates the arc into a vertical semi-circle alternately above and below the horizontal plane, and if the alternation is sufficiently rapid the result is a large electric flame half over and half under the electrodes. In practice, the flat electric flame disk is two meters in diameter, and the air carries this flame with it into the furnace and is heated by it to 3,000 deg. centigrade. A considerable portion of the air is thereby split into nitrogen and oxygen, and by rapid cooling these two elements are prevented from again uniting. Schoenherr, one of the engineers of the Badische Anilin & Farbenfabrik (lately much mentioned in connection with Friederich Bayer's new process for the synthetic production of rubber), has also developed an electric furnace for taking nitrogen from air, and this is used concurrently with the Birkeland type at the Norwegian works, and a third method is that invented by Pauling in 1904, used in Austria and now to be used in France. One received a very peculiar impression, says the author, in approaching one of these noiseless factories, which work without raw material, without smoke and almost without workmen. Only electric current, air and water enter into the buildings, and none of these elements in a very modern production is visible to the eye. Yet the output reaches high into the thousands of tons annually.—*Mem. et Trav. des Ingénieurs Civils de France,* July.

In occasional dealings with engineers from France it may be convenient to possess a copy of the *Annuaire des Ingénieurs de France,* 1910, 600 pages, published by J. Loubat & Company, Paris, price 5 francs, in which book, just out, are listed all engineers graduated from the technical schools of that country.

That there is a saving in the maintenance cost of pneumatic tires amounting to 15 per cent. by the use of wire wheels instead of the customary wooden wheels for automobiles is said by C. Faroux to be a contention capable of verification in practice; that is, the author maintains that the economy is indisputable, and he estimates it from the data at his disposal at about 25 per cent.—*La Via Automobile,* August 27.

The Road Congress held this year at Brussels passed definite recommendations which had been worked out by the technical commission of the Automobile Club of France, with regard to the maximum speeds at which different classes of automobile pleasure and utility vehicles can be considered as not injurious to road surfaces and also with regard to the width of tires required for different loads and constructions. The details as given seem to represent a compromise between the interests of the automobile industry and those of the road authorities.—*La France Automobile,* August 27.

Owners of an electric furnace of 150 kilowatts, in Germany, wished to ascertain the heat losses due to radiation and thereby the caloric efficiency of their plants. For several days a bath was maintained at a constant temperature of 1250 to 1260 degrees centigrade, and this required the energy of 33 kilowatts. The thermic efficiency at 1250 degrees was thus 150 minus 33, divided by 150, or 78 per cent. At 1425 degrees the efficiency was similarly found to be 74 per cent. In order to reduce these losses due to radiation of the walls, double walls were built around the furnace and in the space between the inner and outer walls gas was burned to keep the walls hot. Apparently the object was to secure an equable temperature throughout the whole mass of molten metal. Trials with much larger furnaces built on the same plan succeeded perfectly.—*Jour. du Four Electrique,* Aug. 1.

"Internacional Matematikal Lexico," by Louis Coutural, 36 pp. G. Fisher, publisher, Jena, Germany, price 1.50 mark, is a pamphlet in "ido" language, giving the equivalents of all mathematical terms in "ido," English, French, German and Italian.

Details of temperature measurements in Nathusius 5 1-2 ton steel furnaces given by Prof. Neumann of Darmstadt disclose heats scarcely higher than those employed in the Siemens-Martin basic process. The well-established refining effects of the electric melt must, therefore, be attributed rather to a non-oxidizing atmosphere in the apparatus than to high heat. The account shows that, while it is possible to maintain much higher heats in the electric furnace, these are not necessary or desirable except possibly for the easier disposal of basic slags.—*Journal du Four Electrique,* September 1.

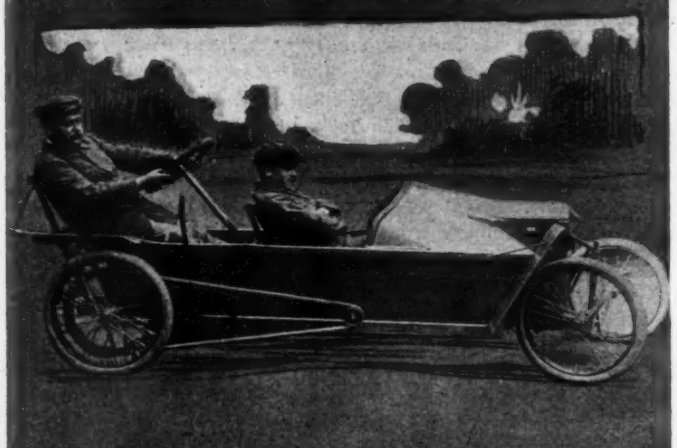
Calcium carbide to the amount of 2,000 tons is now used in the autogenous welding industry in Europe, as compared with an only slightly larger tonnage used for illumination purposes during the same period of one year. Some silica carbide is also used.—*Journal du Four Electrique,* September 1.

Courses in chemical technology especially intended for students of law and social economy have been instituted at several Prussian universities.—*Zeitschrift für Amewandie Chemie.*

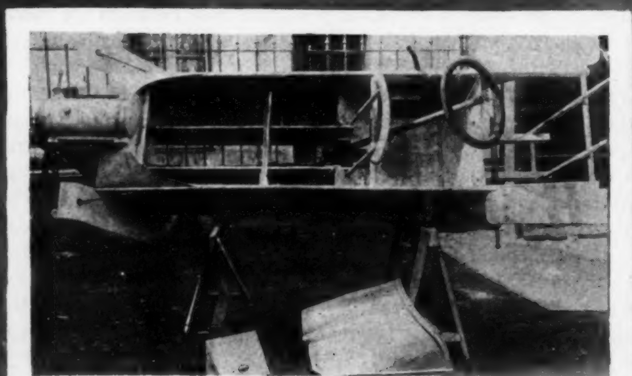
The Littlest French Car

TINY SUBSTITUTE FOR THE MOTORCYCLE THAT IS MEETING WITH FAVOR—IT COSTS LESS THAN $300 AND CARRIES TWO COMFORTABLY

Bedelia Two Seated Runabout



Chassis Tilted Showing Interior



Front View Showing Motor

THE motorcycle being looked upon with disfavor in France, attempts have not been wanting to find a substitute in the form of a small car costing little more than the two-wheeler, while having double the carrying capacity and infinitely more comfort. Among the half-dozen $300 cars which have been brought forward during the past year only two or three have received any support from the public. Among the successful ones is a vehicle known as the Bedelia, and which may truly be described as the connecting link between the motorcycle and the automobile.

This car, which is put on the market complete with a two-cylinder air-cooled motor for a fraction under $300, is an eminently simple yet really practical construction with accommodation for two passengers tandem fashion and a fairly reasonable amount of room for baggage. Its two tubular axles are 99 inches apart, and the track is 36 inches. Between the two axles is carried a long boat-like body, with its main frame of armored wood and the side members covered in with sheet aluminum. At the forward end the body is narrowed to just the width necessary to receive the motor, which may be either a single or a two-cylinder V-type air-cooled model. The sides of the motor are enclosed by a sheet metal sliding panel and the top occupied by the electrically-welded gasoline tank. The front remains open in order that a strong current of air may be carried onto the motor.

The first step in the transmission is a single chain from the motor shaft to a countershaft midway on the length of the car. Tension of the chain is varied by altering the position of the motor, and for this purpose a broad wooden wedge is carried between the rear of the crankcase and a transverse frame member, and on the movable hangers being slackened off a little the wedge is driven home until the slack of the chain has been taken up.

Two pulleys are mounted on each extremity of the countershaft, and from one of these the drive is taken to the rear wheels by means of V-belts. The second pair of pulleys is of smaller diameter than the set usually employed; thus when heavy work has to be performed a rapid reduction in gear ratio can be made. This change is made possible by the fore-and-aft motion given to the rear axle. It is attached to the rear of inverted semi-elliptic springs shackled at their forward end, and provided with a central seating which can be moved forward or rearward, as desired, by means of a side lever. It is this which also allows of slackening off the belt sufficiently to make the engine run free. The front axle is pivoted on a vertical spindle, with a coil spring for suspension. Steering is by inclined column with connection made to the axle by means of a stranded wire cable wound round a drum on the base of the steering column.

The driver's position is entirely at the rear, directly over the axle. His passenger is carried in a reclining position exactly in the center of the body, and is really provided with a better suspension than can be found on some cars costing ten times the price of the little Bedelia. Being low and covered in by a sheet-metal bonnet, he is thoroughly protected against the wind. The car is built so low that no step is needed to get into it. Its head resistance is very low, and, as can be imagined, its weight is very moderate. Fully equipped for the road the makers state that the car does not scale more than 330 pounds. The combination of long wheelbase and narrow track makes the use of a differential unnecessary. In France the Bedelia is taxed as a motorcycle. Although it has four wheels of 650 mm. diameter its cost of upkeep should not be any higher than that of a two-wheeler.

Among the Makers

ILLUSTRATING THE METHODS OF FASHIONING WOODWORK FOR STEERING WHEELS—DETAILS OF THE DETROIT ELECTRIC FOR 1911—KELSEY BUILDS A MOTORETTE—OVERLANDS FOR 1911

SHOWING PROCESSES IN THE MANUFACTURE OF MAHOGANY RIMS FOR STEERING WHEELS—PACKARD

WOODWORK in automobiles includes second-growth hickory for wheels, mahogany for the rims of steering wheels, dashboards in various effects, ash as it is employed in body framing, and white wood and other varieties of soft wood in body work, not forgetting that chassis frames, in some of the better class of automobiles, notably the Franklin, as well as the Panhard, are fashioned in wood.

That wood is a substantial material is no better illustrated than by the fact that the first chariot wheel of which this civilization has knowledge was made prior to 4000 B. C., and after it was used in service for a time, the length of which history fails to relate, was buried in a mummy pit at Nineveh, where it remained in seclusion until it was uncovered a few years back, and it now rests in a museum in New York. This wheel was examined and photographed by the Editor of THE AUTOMOBILE a few months ago, and the wood is in an excellent state of preservation, although it shows evidences of services once rendered.

Perhaps the most important point in relation to the woodwork in automobiles has to do with the proper selection of the wood that is to be employed. It is not true that there is any material shortage in the supply of second-growth hickory as it is demanded for use in spokes, but it is true that some of the hurry-up methods employed in the manufacture of wheels are productive of the kind of wheels that should not find an abiding place in automobiles. In Missouri, where second-growth hickory may be found in abundance, which State is now relied upon by the wheel-making industry to supply the demand for this character of wood, the natives are

skilled in the art of felling the trees at the proper season of the year, *i. e.*, in the winter time. They are conversant with the good that comes if the wood is cut into suitable lengths and corded there to be left until it is nature-seasoned, and thereafter to be shipped to the plants wherein it undergoes further culling, and the best selections are fashioned into spokes and felloes. But in the mad desire on the part of those who care little for quality to put in an appearance of furnishing much for little without really doing so, all these necessary methods of procedure are short cut, and the wood is shipped as it is felled in the green state, after which it is thrust into a seasoning oven, or, better yet, subjected to a kiln-drying process and the life is baked out of it.

Wheels thus produced offer dangers to the autoist; they collapse on a curve when the speed is high, but even if they do eke out a precarious existence, as it were, they creak and groan under the load, so that the autoist, who is so unfortunate as to pay good money for the car so made, groans too.

Fortunately, this practice is being discountenanced by the makers of automobiles of pretense, and rather than put up with the damaging association with half-baked wheels from poorly selected wood, they are installing their own wheel-making plants, and selecting the wood with care and discrimination. In the meantime the purchasing public finds itself confronted by a coat of paint, shielding the good wheel and the bad wheel equally. How is the purchaser to know the difference between the two? Perhaps the reputation of the company that makes the car will be as good as the woodwork that is used in the wheels of its product.

In this connection it is interesting to note that wire wheels have gained great favor in England. Quite a few manufacturers fit their car as a standard equipment with wire detachable wheels. The claim of the makers of these wheels is that they will stand greater side strains than those made of wood. The other advantage of these wheels is that a spare can be carried, doing away with detachable rims. The spokes are fitted tangentially.

Detroit Electrics for 1911

MODEL P IS A ROADSTER TYPE WITH A LOW CENTER OF GRAVITY; MODEL N IS A LARGE FOUR-PASSENGER VICTORIA; MODEL D IS A BROUGHAM

CHIEF among the changes in the Detroit Electrics as manufactured by the Anderson Carriage Company, of Detroit, Mich., is represented in the direct shaft-drive transmission without reduction from chain to gears. Fig. 1, depicting the Model P Roadster type, is an excellent illustration of the result showing a low center of gravity with an underslung chassis frame, large diameter road wheels and other evidences of progress. This car has an 86-inch wheelbase, half elliptic springs front and rear and the Edison battery is placed under the bonnet in front, making the same quite as get-at-able as a motor in gasoline work. In fine, the general construction of this new model has all the earmarks of the gasoline car, and the body, with its fore-door construction and high superstructure, conforms to the newer practice in body work. Back of the seat line the platform is commodious, affording ample room for the carrying of personal baggage, besides a roomy tool box and whatever else the tourist might care to take along.

It is considered of no real value to rate an electrical motor at some specific power; it is more to the point to furnish a motor that will operate at a low fixed loss and deliver power as required under the varying road conditions, limiting the increase in temperature of the hottest part of the motor to some safe point, as 50 degrees centigrade, if the motor is run under certain prescribed conditions, but these are all matters with which the purchaser is but little concerned provided the motor is so designed as to conserve the battery energy and make the radius of useful travel sufficient for the needs.

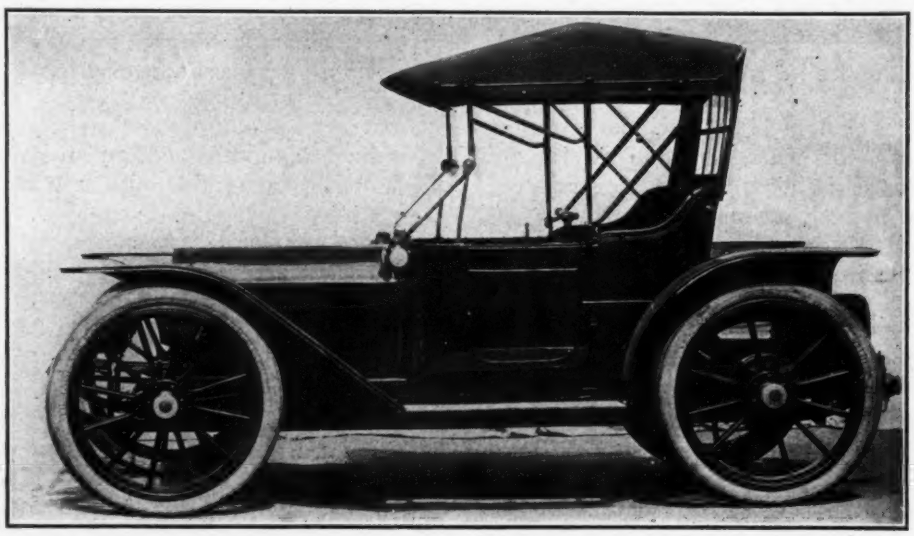


Fig. 1—Model P, Roadster type of Detroit Electric

The electrical equipment, not considering the battery, is made by the Anderson Carriage Company in its own plant, and the problems involved in this portion of the equipment have been brought to such a high state of perfection that there would be no news value in a reiteration of the well-known facts regarding the established quality of electric motors for vehicle work, particularly when they are produced for a specific purpose such as this.

Edison Battery Is Not Generally Well Understood

After recounting the advances made in the vehicle construction, as shown in Fig. 1, it is more than likely that a discussion of the characteristics of the Edison Battery which is used in Detroit Electrics will be of the greatest interest. In presenting a type of car along lines as indicated in Model P the company has in mind the idea of affording to its clientèle the advantages which are so well appreciated as being present in electric vehicles, supplemented by the further advantage of increased radius of travel and decreased battery depreciation, insofar as the state of the art will permit.

Those who have experience with electric vehicles are perfectly alive to the fact that average per-

formance of the battery is more to the point than anything that can be said involving initial radius of travel. In the past it has been found that increasing the initial radius of action was decidedly at the expense of average radius of travel. By radius of travel is meant the distance that a vehicle will travel and be able to come back on the same charge; the actual miles traveled would therefore have to be double the radius of travel. Initial radius of travel is, of course, the radius of action with a new battery; average radius of travel will therefore be the average result obtained during the useful life of the battery. In the earlier efforts along these lines it was found that the battery with the greatest initial output had the shortest life; under these conditions it was, of course, self-evident that if a battery was made with a large surface and light grids its initial output would be relatively high, but its ability to withstand continuous service was limited by the lack of stability of the construction. Then, too, there is the question of sulphation. If a battery is prone to sulphate this disorder will creep in in the night-time when the car is standing in the garage as well as in the hours when the

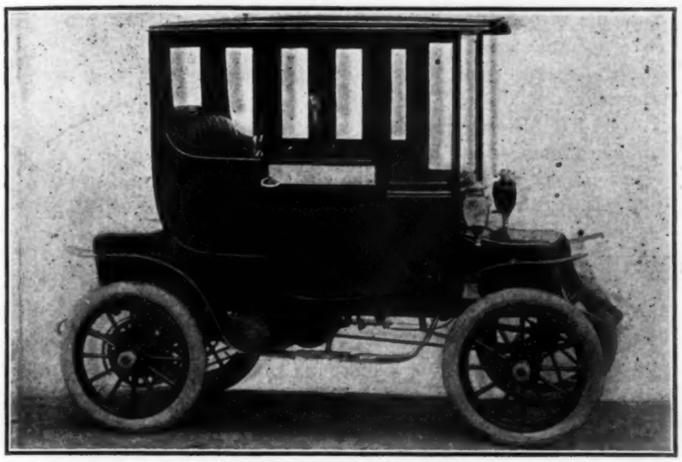


Fig. 2—Detroit Electric Model M Brougham

car is running on the road. One of the claims for the Edison type of battery, as used in this car, has for its foundation the fact that automatic sulphation is eliminated.

In this form of battery the positive plates consist of steel grids, which are nickel plated; they are in the form of nets of 30 tubes per grid, each of which is filled with active material, the latter being composed of pure metallic nickel in the form of leaves or flakes. The pure nickel flake is produced by an electro-chemical process. The negative plates are composed of 24 flat rectangular pockets which are supported

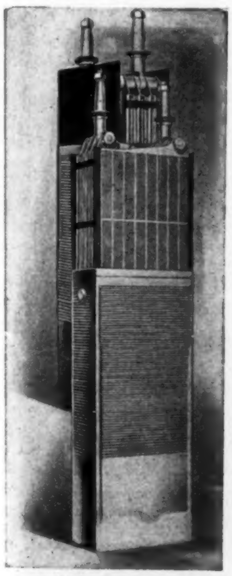


Fig. 3—Type A-4 cell with contents of container partly lifted, showing alternating positive and negative plates assembled

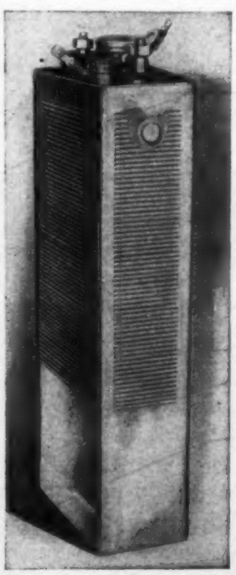


Fig. 4—Cell complete ready to go into a battery of cells

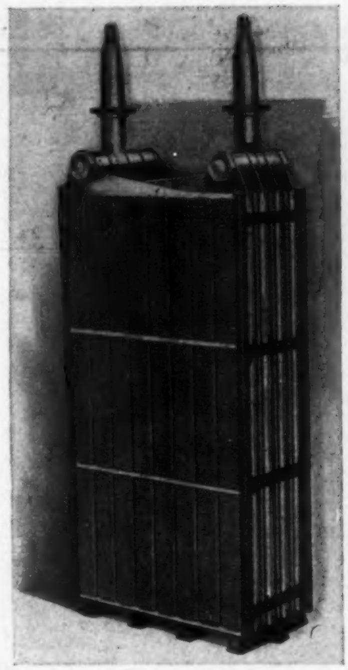


Fig. 5—Showing positive and negative plates of the A-4 cell assembled together, but removed from the container

Fig. 6—Type A-4 cell, showing the positive and negative plates in the container, and also the removed cover with openings

in three horizontal rows in nickel-plated steel grids. These pockets are also formed out of thin nickel-plated steel and they are full of perforations. The active material in the pockets forming the negative element of the battery is oxide of iron.

The positive and negative plates are assembled alternately, as shown in Fig. 6, where they are placed within the containing cell, which is also made of sheet steel. A better idea of the construction of the plates or elements is shown in Fig. 8, with the positive element in the foreground and the negative structure in the background. The capacity of a type A-6 Edison battery is as follows:

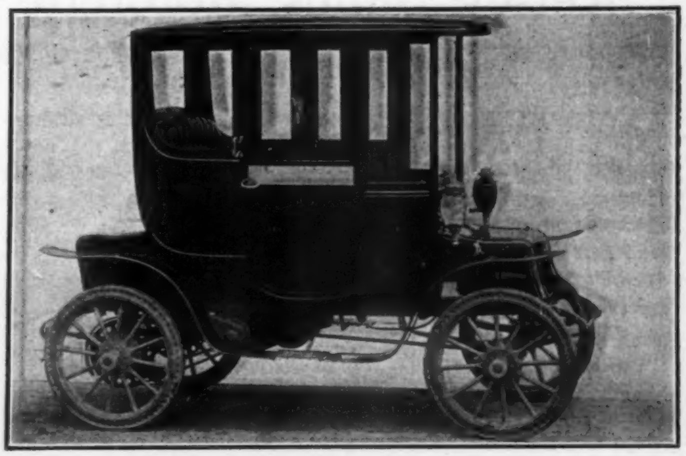


Fig. 7—Detroit Electric Model MS Brougham

CAPACITY OF TYPE A-6 EDISON BATTERY

Charged Seven Hours at 45 Amperes. Discharged at 45 Amperes.

Ampere-hour input	315.0
Ampere-hour output	268.5
Average potential difference of charge	1.692
Average potential difference of discharge	1.202
Watt-hour input	533.0
Watt-hour output	322.7
Ampere-hour efficiency (per cent.)	85.2
Volt efficiency (per cent.)	71.1
Watt-hour efficiency	60.6
Output per pound in watt-hours	16.8

The covers are so designed that the columns of the positive and negative plates pass through stuffing boxes formed in the apertures, the idea being to prevent the electrolyte from spilling

out. The liquid which forms the electrolyte is a 21 per cent. solution of caustic potash dissolved in distilled water. This is poured in through an orifice in the cover and a means is provided for rendering the same tight so that the replacement, which is water, will only be that to make up for evaporation, which is at a slow rate.

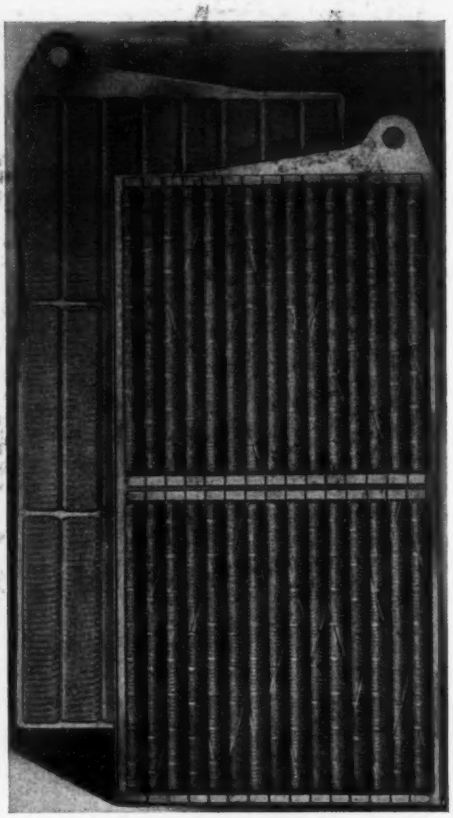


Fig. 8—Type A, positive and negative plates, showing the different structures of each, one tubular and one rectangular

Each cell delivers a mean of 1.3 volts, the maximum open circuit voltage being 1.5 volts, and the range of voltage per cell is between 1.5 volts on open circuit, and 1.11 volts when the cells are said to be discharged. The output of this particular cell is 268 ampere-hours. The battery is made in the several sizes depending upon the service demand, and increasing capacity is afforded by the simple expedient of adding to the number of cells in which the type A-4 has four positive plates and the type A-6 has six positive plates. The method of fastening the plates together is shown in Fig. 5, which is a type A-4 assembly, Fig. 3 being of the same type of cell with the elements partly lifted out of the can or container. The cell complete ready to be assembled into a battery, of which there may be any desired number, is shown in Fig. 4.

It is claimed for this type of battery that it has no deteriorating action, as the tendency to sulphate, and that its life is only reduced the amount represented by normal depreciation which represents an increment of useful work for an increment of life. Electrochemically the battery is in a state of stable equilibrium and when it is in good working order, which is mostly a matter of keeping the electrolyte up to the proper level and giving the battery its full charge, it will remain in this condition until the charge is tapped away in the form of useful work. In view of the stability afforded in the battery the owner of a car is enabled to figure on the radius of travel with much certainty, which is of considerable value to the user of an electric, and the inroads of time are at such a slow rate that satisfaction is a normal expectation.

In addition to the Model P car the company's offering for 1911 includes the Model M Brougham, as shown in Fig. 2, and the Model MS Brougham, as shown in Fig. 7. There are several other offerings and numerous options for purchasers of discrimination; those who prefer the chain drive are permitted to indulge in their whim and if perchance the lead-type of battery is given a preference, it, too, will be supplied to the exclusion of the Edison type of battery.

It is the fair claim of the company that the battery and other equipment used should be in the light of the service to which the vehicle is to be devoted; whim and fancy are not to be indulged in excepting grudgingly if good and sufficient service are prime requisites.

Kelsey Builds Motorette

PRESENTING A NEW TYPE OF GASOLINE MOTORETTE WITH A SINGLE REAR WHEEL WHICH SERVES AS THE TRACTOR

MOTORETTE, so-called, came from abroad and is substantially a reversal of the old tricycle idea in that the single wheel is placed at the rear and is used as a tractor, so that the front portion of the body rests on a conventional type of front axle pivoted on steering knuckles in the conventional way. The tricycle scheme was found to be defective. Cars so made were too easily turned over; a little experimenting, however, resulted in the Motorette, a good example of which is shown in Fig. 1, which is a new product made at the plant of the C. W. Kelsey Manufacturing Company at Hartford, Conn. There are many points of merit residing in this plan of vehicle, and that this situation received early recognition may be known from the fact that Leon Boillé, prior to the introduction of the well-known Leon Boillé type of automobile, took a turn at building motorettes, but the state of the art did not at that time encourage his further efforts.

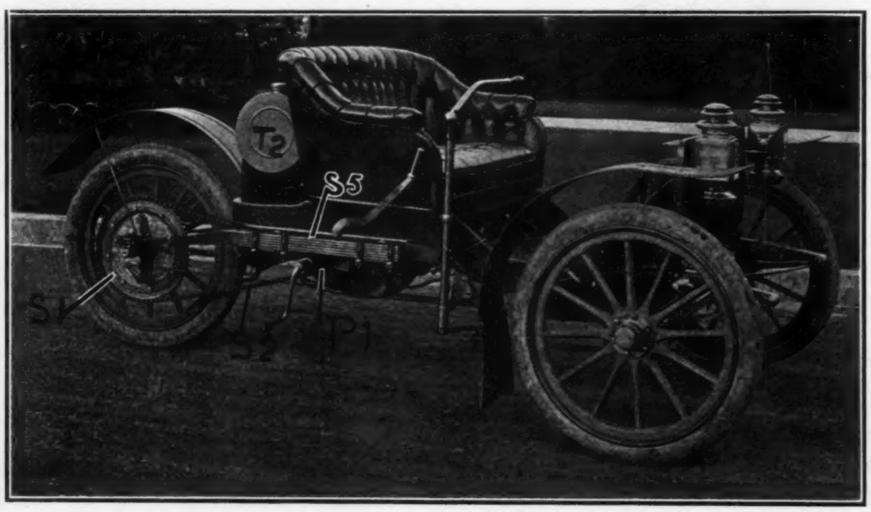


Fig. 1—Side elevation of the Kelsey Motor ette, showing the single rear wheel drive and other important details

C. W. Kelsey, president of the C. W. Kelsey Manufacturing Company, while intimately associated with the automobile business along other lines for a number of years, and who will be remembered in connection with the Maxwell-Briscoe Motor Company as sales manager up to a short time ago, built his first three-wheel car as far back as 1897. His trouble then seemed to be due to lack of ability to induce a sufficient measure of lateral stability at the rear end of the car

where the frame rested upon one wheel only. Fig. 2 shows how well this phase of the situation is taken care of in the present car, in which T1 is the tractor wheel at the rear of the car, and L1 represents a lever arm which reaches out about 48 inches, so that the turning moment, considering the weight of the man who is standing on the lever, is not far from 9,000 inch-pounds. With this considerable turning moment the sag of the frame at the rear is imperceptible and the tractor wheel remains substantially in the vertical plane. This illustration shows with excellent clearness that the third wheel, serving as a tractor, is also a sufficient support for the rear end of the vehicle. It will be readily appreciated that this form of construction does away with the necessity of using a differential gear for compensating purposes, since there is but one wheel to drive and there is no occasion for compensation. The two front wheels work entirely independent of each other just as they do on conventional types of automobiles, and, of course, they are quite free from the hampering consideration that demands the presence of a differential gear in the makeup of the rear axle of every automobile that uses two wheels for tractive purposes.

A further glance at Fig. 2 will disclose the sprocket wheel S1 fastened to the driving wheel, a side view of which will be found in Fig. 1, S1, and the sprocket pinion P1 is a sufficient distance forward to make the sprocket chain S2 comfortably long. The spring suspension at the rear incorporates the "buckboard" idea, using two flat spring members S3 and S4 (see Fig. 2), a better view of which, including the method of fastening, is given as S5 in Fig. 1. This machine, which will be marketed under the name "Motorette," weighs 475 pounds; the motor is of the double-opposed type in point of design, following along motorcycle lines, and is built self-contained, including a two-speed forward and one reverse planetary gear, which is incorporated in the same housing. The speed of the car is maximum at substantially 30 miles per hour. The construction is such that the ground clearance is 10 inches, and in the management of the car provision is made for careful oiling by a sight-feed system, which, together with other nice features of design, leaves nothing to speculation, nor is the operator in need of over-much skill. The lubricating oil supply and the provision for its use is on a basis of one gallon, and the gasoline supply of six gallons is held in a circular tank T2 back of the seat. This is enough of a supply of fuel to furnish the energy requisite for a travel of 180 miles maximum. The material and workmanship throughout the product are on a carefully worked out basis; Timken roller bearings

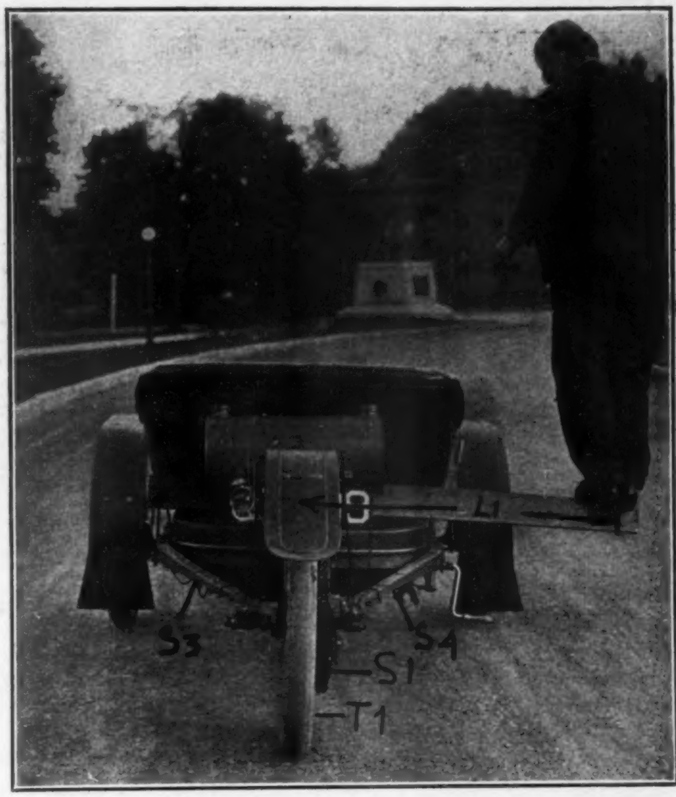


Fig. 2—Rear view of the motorette, showing lateral stability and a flexible spring suspension

are used in the rear wheels, and the front axle is of the I-beam section drop-forged from steel. The front spring suspension is of the full-elliptic type and considering the constant loading at the front end the springs are relatively supple so that the road performance is soft and the snubbing action of the springs fits the requirement under the most severe conditions of travel.

The car is fitted with oil lamps, has a tiller steering gear, side lever control, and such other features as would seem to accord with the necessities in view of the character of the work for which motorettes are intended. The price is $385, f.o.b Hartford, and it is the present intention of the company to turn out about 10,000 of these little cars during the next eight months.

Overlands for 1911

SEVERAL NEW MODELS AND MANY REFINEMENTS WILL MARK THE COMING YEAR'S PRODUCT—SLIGHT REDUCTIONS IN THE PRICES OF SOME MODELS ARE ALSO ANNOUNCED

THE Willys-Overland Company, of Toledo, Ohio, are making a bold bid for 1911 business, and are presenting six models of pleasure cars with several types of bodywork. They are built along the lines of last year's models, but some departures have been made and Models 45, 49, 50 and 52 are new, with some distinctive features.

One particular change is that the 1910 model that sold for $1,100 will be sold in 1911 for $1,000, but with three-speed selective transmission will be marketed for $1,095.

The runabout Model 45 is entirely new and is fitted with a four-cylinder motor, 3 1-2 inch bore x 4 1-2 inch stroke, magneto ignition, multiple disc clutch and a low racy or torpedo body. The transmission is of the planetary type and the front axle is an I-section drop forging.

Wheelbase lengths vary from 96 inches in Models 45 and 46 to 118 inches in Models 52, 53 and 54. Models 37 (the delivery wagon), 38 and 49 are 102 inches long; Models 50 and 51, 110 inches, and Models 40, 41 and 42, 112 inches. Fifty-six inches is the standard tread, although there is an option of 60 inches in all models but Nos. 37, 45, 46, 50, 53 and 54.

Tire equipment calls for 34 x 4 front and rear on Models 41, 42, 52, 53 and 54; 34 x 3 1-2 for Models 40, 50 and 51; 32 x 3 1-2 for Models 38 and 49; 32 x 3 for Models 45 and 46, and 33 x 4 for Model 37 (delivery wagon).

Mechanical Refinements in Models 52, 53 and 54

The power plant in Models 52, 53 and 54 is on a common basis, utilizing a four-cylinder, water-cooled motor of the four-cycle type, the general appearance of which is presented in Figs. 4 and 8. Referring to Fig. 4, which is the left-hand side of the motor, the four cylinders C1, C2, C3 and C4 are cast individually of a special grade of close-grain iron, but they are so designed that the amount of finish allowed for in the bore is just sufficient for the intended purpose and the formula of the mixture used in the charge is such that the characteristic of the iron shows a chill tendency, the object being to have the

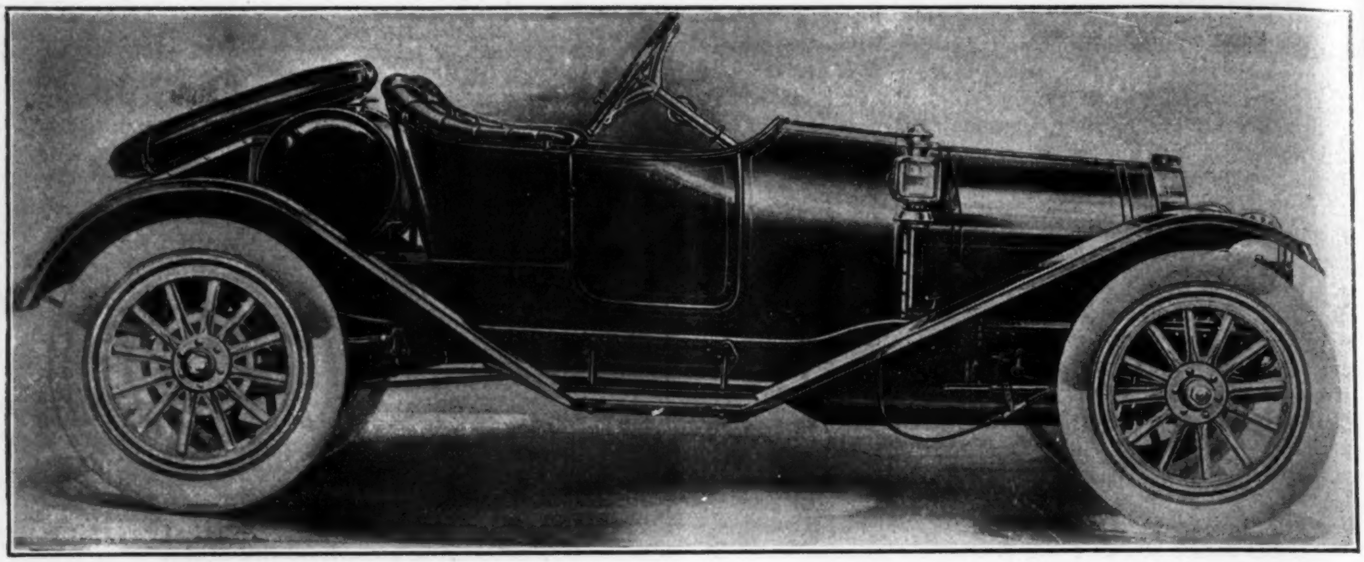


Fig. 1—Presenting Model 53 Overland with an overhanging cowl curved fore-doors, perfectly smooth exterior, a large gasoline supply and a place for the spare tire

finish bore of the character which comes from the presence of white iron, the result being that the walls of the cylinders take on a high polish and besides reducing friction to a minimum as well as inducing longevity, affords no anchorage for carbon formations.

The motor is cooled by the thermo-syphon principle and the back of the radiator shows at R1, with a water box W1 at the top, and a water connection C4, with a suitably designed water manifold M1, with its four legs L1, L2, L3 and L4 of varying lengths to suit the established hydraulic grade. Water connections are made at the top of the cylinders and the allowance for water space over the domes is deep. The refined details of this thermo-syphon system of cooling are in wide contrast with the relatively coarse practice of a year ago.

The greatest difficulty in recent times which bothers the autoist beyond reason and results in an undue cost is involved in the thermic relations as they are governed by the proper utilization of heat units in the fuel on the one hand and the efficacious disposition of the thermic losses on the other. Were it possible to get the average autoist to realize that a single heat unit represents enough energy to lift 142.4 pounds to a height of 1 foot in one minute of time, and that over 80 per cent. of all the heat units represented in the fuel goes to waste, the further task of showing the opportunities for thermic trouble would be much simplified.

At all events there are 20,000 heat units, more or less, in a pound of gasoline. It possesses a greater measure of energy than a pound of nitro-glycerine and it may not be generally understood that substantially 83 per cent. of the composition of this gasoline is nothing more nor less than coal; in other words, carbon. As the demand for fuel increases, the more volatile portion falls short of the requirement and less volatile products are incorporated as a commercial necessity. This reduction of volatility of the fuel coupled with the larger percentage of carbon present, operating under conditions that are a near approach to those that obtain in coke-ovens, leads to carbon trouble in poorly designed motors.

As to the refinements of the motors for use in 1911 Overland cars, the designer recognized the impotency of revamping the main ideas along trodden paths. It is a thermic problem, pure and simple, and with the coming of heavier and less volatile grades of fuel the paramount issue was that of carbon accumulations, it being necessary to solve the mystery of their formation and apply the proper remedy to prevent a continuance of the trouble.

In the older school of motor designing the attention of the expert was riveted on the main point, *i. e.,* power to the exclusion, perhaps, of the questions involving continuity of service. Of course the motor ceases to be valuable to the user when preignition sets in, as it does, due to carbon accumulations, and it was found after some effort that the compression must be fixed, not only to obtain the high thermal efficiency, but also for the purpose of more intimately intermingling the thermal components of the mixture with the oxygen of the atmosphere, of which the mixture is largely composed. Investigation along these lines resulted in determining as to the proper compression to establish, but it was also found that the interior walls of the cylinders as well as the heads of the pistons had to be finished to a high degree and then "buffed" in order to discourage the clinging of the carbon particles to the surfaces.

Glancing again at Fig. 4, the cylinders are cast L-type with a symmetrical exterior, bringing the inlet and exhaust valves to one side so that the exhaust manifold E1 is of graceful design, sweeping back beyond the last cylinder and then down, while the inlet I1 has a stand pipe S1 leading up from the carbureter and from its horizontal portion four branches, B1, B2, B3 and B4, lead to four well-designed transfer ports and thence to the inlet valves, which are of large area and short lift. The method of fastening the manifolds is clearly shown in Fig. 4, there being four yokes, Y1, Y2, Y3 and Y4, spanning the distance between the adjacent branches and serving in common for the intake and ex-

SPECIFICATIONS FOR OVERLAND

MODELS	Price	H.P.	BODY		MOTOR				COOLING		IGNITION		Lubrication
			Type	Seats	Cyl.	Bore	Stroke	Cyl. Cast.	Radiator	Pump	Magneto	Battery	
Model 37	$1000	22.5	L't del.	2	4	3¾	4½	Single.	Tubular.	Syphon.	Remy	Dry	Mech.
Model 38	1000	22.5	Any	4	4	3¾	4½	Single.	Tubular.	Syphon.	Remy	Dry	Mech.
Model 40	1200	28.9	R'bout.	4	4	4¼	4½	Single.	Tubular.	Syphon.	Remy	Dry	Mech.
Model 41	1300	28.9	Tour'g*	5	4	4¼	4½	Single.	Tubular.	Syphon.	Remy	Dry	Mech.
Model 42	1400	28.9	Tour'g.	5	4	4¼	4½	Single.	Tubular.	Syphon.	Remy	Dry	Mech.
Model 45	775	19.6	R'bout.	2	4	3½	4½	Single.	Tubular.	Syphon.	Remy	Dry	Mech.
Model 46	850	19.6	Torp'o.	2	4	3½	4½	Single.	Tubular.	Syphon.	Remy	Dry	Mech.
Model 49	1095	22.5	Any	4	4	3¾	4½	Single.	Tubular.	Syphon.	Remy	Dry	Mech.
Model 50	1250	25.6	Torp'o.	2	4	4	4½	Single.	Tubular.	Syphon.	Remy	Dry	Mech.
Model 51	1250	25.6	Tour'g.	5	4	4	4½	Single.	Tubular.	Syphon.	Remy	Dry	Mech.
Model 52	1600	28.9	Tour'g.	5	4	4¼	4½	Single.	Tubular.	Syphon.	Bosch	Battery.	Splash
Model 53	1600	28.9	Tor. Rt.	2	4	4¼	4½	Single.	Tubular.	Syphon.	Bosch	Battery.	Splash
Model 54	1675	28.9	Tor. Tg.	4	4	4¼	4½	Single.	Tubular.	Syphon.	Bosch	Battery.	Splash

†Or 60 inches. *Or close coupled.

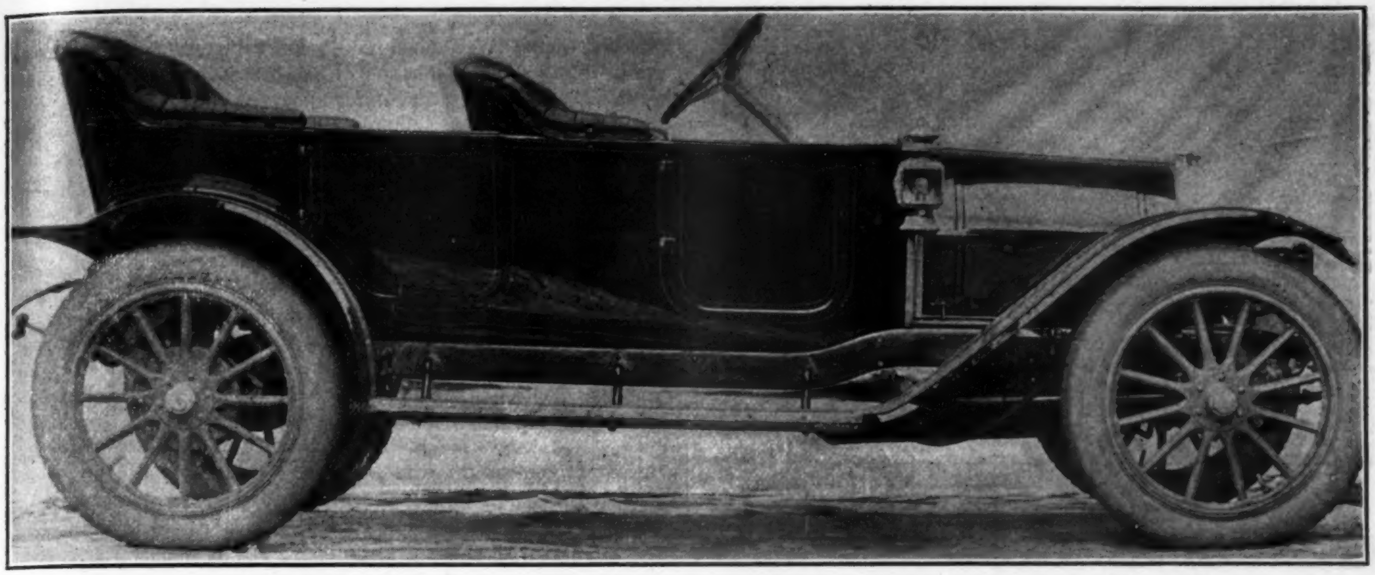


Fig. 2—Depicting Model 52, fore-door type of five-passenger touring car with a smooth exterior, wide entrance, and a clean running board

haust manifolds, and allowing for speedy removal of the piping.

There are eight spark plugs, S1, S2, S3, S4, S5, S6, S7 and S8, inserted in covers over the valves that are utilized in con-

CARS AS OFFERED FOR 1911

Clutch	TRANSMISSION				Wheelbase	Tread	Frame	BEARINGS			Weight	TIRES	
	Type	Speeds	Loca-tion	Drive				Crank-shaft	Trans-mis'n	Axle		Front	Rear
M'l. disc.	Planet...	2	Axle...	Shaft...	102	56	P. Steel.	5 Plain.	Ball....	Ball....	....	33x4	33x4
M'l. disc.	Planet...	2	Axle...	Shaft...	102	†56	P. Steel.	5 Plain.	Ball....	Ball....	....	32x3½	32x3½
M'l. disc.	Planet...	2	Axle...	Shaft...	112	†56	P. Steel.	5 Plain.	Ball....	Ball....	....	34x3½	34x3½
M'l. disc.	Planet...	2	Axle...	Shaft...	112	†56	P. Steel.	5 Plain.	Ball....	Ball....	....	34x4	34x4
Cone....	Selecti'e.	3	Axle...	Shaft...	112	†56	P. Steel.	5 Plain.	Ball....	Ball....	....	34x4	34x4
M'l. disc.	Planet...	2	Axle...	Shaft...	96	56	P. Steel.	5 Plain.	Ball....	Ball....	....	32x3	32x3
M'l. disc.	Planet...	2	Axle...	Shaft...	96	56	P. Steel.	5 Plain.	Ball....	Ball....	....	32x3	32x3
Cone....	Selecti'e.	3	Axle...	Shaft...	102	†56	P. Steel.	5 Plain.	Ball....	Ball....	....	32x3½	32x3½
Cone....	Selecti'e.	3	Axle...	Shaft...	110	56	P. Steel.	5 Plain.	Ball....	Ball....	....	34x3½	34x3½
Cone....	Selecti'e.	3	Axle...	Shaft...	110	†56	P. Steel.	5 Plain.	Ball....	Ball....	....	34x3½	34x3½
Cone....	Selecti'e.	3	Axle...	Shaft...	118	†56	P. Steel.	5 Palin.	Ball....	Ball....	....	34x4	34x4
Cone....	Selecti'e.	3	Axle...	Shaft...	118	56	P. Steel.	5 Plain.	Ball....	Ball....	....	34x4	34x4
Cone....	Selecti'e.	3	Axle...	Shaft...	118	56	P. Steel.	5 Plain.	Ball....	Ball....	....	34x4	34x4

junction with the new Bosch "two independent systems" of ignition, which it will be remembered utilizes a Bosch high-tension magneto as the main source of electrical supply and a battery auxiliary which includes a self-starting button, affording adequate protection in the event of the unforeseen and the highest development in magneto ignition service under normal conditions. The wiring system has been planned in the light of modern investigations; it was learned that tubing of any kind utilized as a conduit of high-tension wiring diminishes the efficiency of the system because of the induced effects that are accentuated and distorted when a high potential, high frequency, electromotive force is impressed on an electrical circuit, if the same is in juxtaposition with parallel conductors that are so placed as to set up the phenomena which may be termed condenser effects. True it would be possible to put lightning arresters on improperly designed ignition systems and these devices would tap away the superimposed accumulations from time to time, but such methods lead to additional complication, whereas by resorting to the simple design as here presented the whole series of complex and troublesome tendencies is excluded from the calculation. The high-tension leads are run in the open and are held suspended by

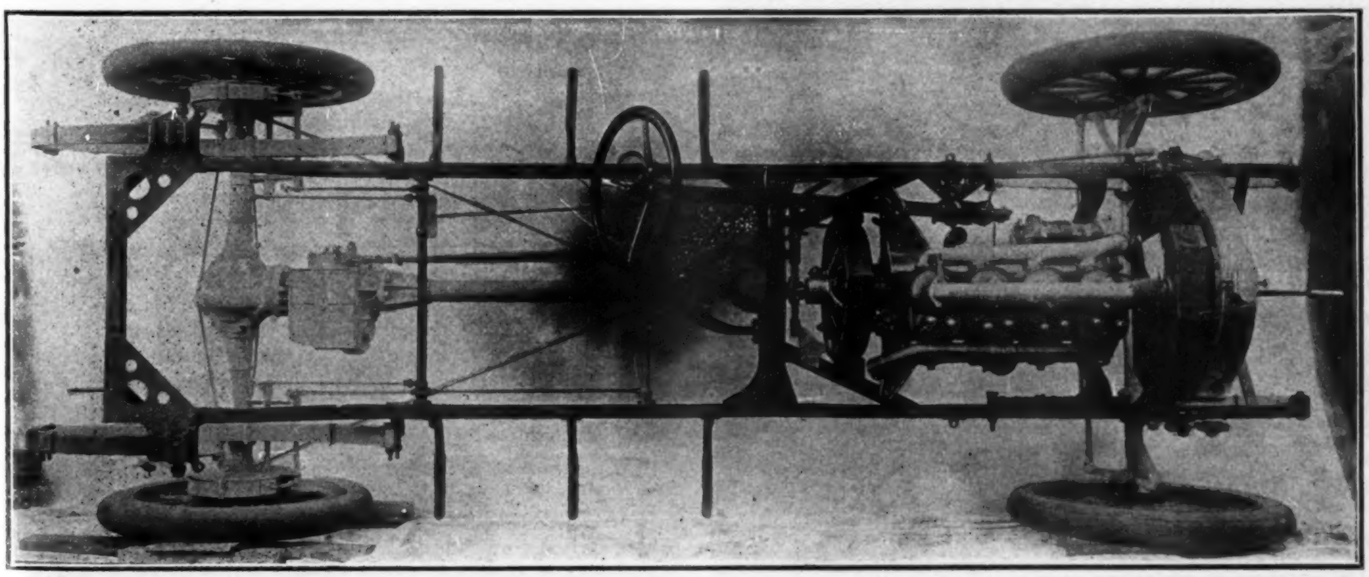


Fig. 3—Plan of the chassis of Models 52, 53 and 54, including 35 H. P. motor, cone clutch, universal joint and unit type of live rear axle holding a three-speed selective sliding gear

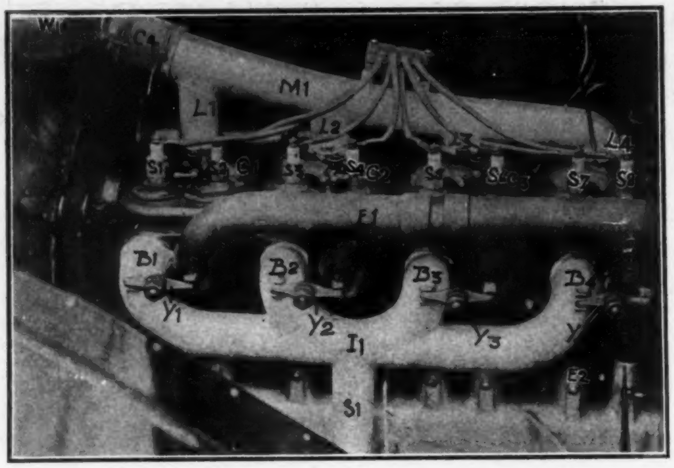


Fig. 4—Looking at the left-hand side of four-cylinder motor, showing the intake and exhaust manifolds, water connection, etc.

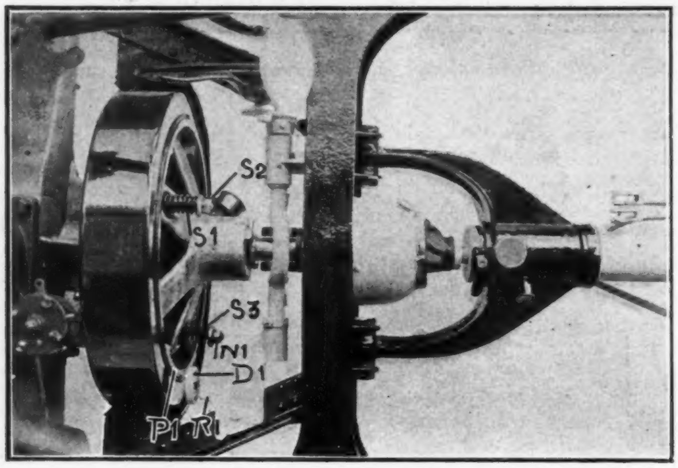


Fig. 5—Plan of the chassis at the combination cross-bar, showing cone clutch in flywheel, controlling mechanism and universal joint

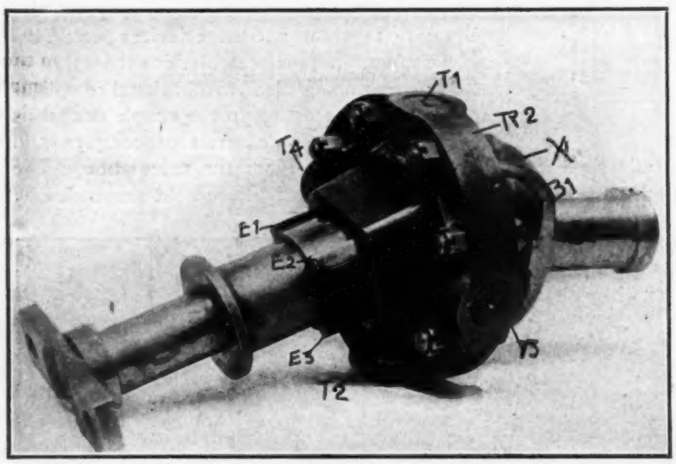


Fig. 6—Presenting universal joint with grease-tight housing removed, indicating liberality of bearing surfaces and efficient slip joint

Fig. 7—Materials of which the gears are made after they were subjected to a test to destruction

several suitable cleats, one set of which is clearly shown at C6.

In the timing of the valves the principle utilized was on a basis of good and permanent work to the exclusion of the usual multiplicity of small parts and the hazard involved, having for its basis the getting out of adjustment of the one or the other of them. The square valve lifts reciprocate in properly contrived white metal bushings that are broached with square holes. Lubricating oil is prevented from seeping out through the good office of a clever contrivance involving the principle of the closure used in ball-bearing work for the identical purpose. At the outer extremity of the bearing an ante-chamber is allowed for, and the path of flow of the lubricating oil is back into the crank chamber through suitable passage ways with a baffle plate forming the extremity and serving as the heading-off member of the oil flow so that it all goes back into the crankcase instead of out and away. The extensions of the crankcase for the valve-lift bearings are shown at E2, of which there are eight, and at the point of contact of the lifts with the valve stems adjusting nuts are placed so that the timing of the valves may be altered at will.

The other side of the motor as shown in Fig. 8 presents the magneto M1 at a point just in front of the steering gear S1, and the water manifolds W1 and W2 are very clearly shown in this view. If it may be taken for granted that the reader is familiar with the Bosch magneto it will suffice to pass on to important matters of detail since they are among the conspicuous aims of the designer whose ambition is to make this 1911 work satisfactory to the autoist who, with his 1910 experience, would prefer to think that a surfeit of the petty troubles will go into history. Take the spark and throttle control systems as a foundation for discussion. It is pointed out that the universal joint U1 is of a ball and socket type and that the material used is of the true cementing order and the facilities afforded at the plant where the parts are made include an electric-welding equipment, muffle and other suitable furnaces and heat-treatment equipment on an extended basis with means for ascertaining critical and other temperatures.

In the new models that are here being described there will be an entire absence of useless trinkets and misplaced accessories; the running board is confined to its legitimate function and a nice illustration of the innermost thoughts of the designer is shown in Fig. 8; the signal horn S2 is located at a point above the magneto under the hood, with the bell pointed in the direction that the car moves, so arranged as to project the sound wave for a suitable distance ahead. It was found by experiment that the sound wave penetrates for a greater distance when the horn is placed in the manner as here shown than when the horn is placed on the running board, due to the fact that the upward sweep of the mudguards serves as a deflector of sound, so that the wave instead of being projected ahead, where it will do the most good, is reduced to the level of a mere noise which bothers the autoist instead.

Troubles in Operation Promise to Disappear

Every autoist has full knowledge of the fact that in spilling water out of a pail the sheet-like conformation of the stream can thus be induced to flow in through an elongated orifice. This information, while it should have been taken advantage of several years ago, finds a belated response in the newer design as shown in Fig. 10, taking on the form of an elliptically shaped filler F1 of the radiator, with a suitably contrived cover C1 for the same. The design includes limit stops S1 and S2, a means for holding the packing P1 in place and a locking bolt B1, which engages in a depression D1 automatically due to the action of a spring which is concealed in the guide boss G1; when it is desired to throw back the filler cap, pressure is exerted against the spring by applying the same to the handle of the bar H1. In order that foreign substances may not find their way into the radiator a screen is located within the filler F1, but the same is so placed that it may be readily removed, cleaned and replaced, thus offering some inducement to the autoist who desires to minimize his repair bill to keep foreign substances from the cooling system.

Perhaps the most wise provision that has been made in connection with the cooling system on a basis to thwart repair bills lies in the construction of the radiator, the same being formed out of flattened copper tubes lying alongside of each other with intervening spring-like gills that serve as separators. In order to find out whether or not a radiator could be constructed in such a way that it would not be disrupted were the cooling water therein contained to be frozen, the experiment was made with this type of radiator with the gratifying result that the freezing of the water in the tubes ended in a slight expansion of the walls, but as soon as the water was melted, which was a mere matter of running the motor until it afforded the requisite quantity of heat, the spring-like gills compensated for the expansion introduced and the tubes re-formed in their normal position did not show even a tendency to disrupt at any point and form a troublesome leak.

Provision Is Made for Handling Torque of the Motor

Translating the power of a motor is regarded as a difficult task in automobile work on account of the inherent defect that resides in every internal combustion type of motor owing to its relatively poor performance under speed-changing conditions. This lack of holding to a constant power when the speed is varied, coupled to the fact that the motor is irreversible, leads to the necessity of using a clutch to disengage the motor from the transmission at frequent intervals, and of a transmission gear system, by means of which the motor may be permitted to run at a high speed at times when the car must travel at a low speed. The clutch problem has ever been serious, and while many forms of clutches are more or less in vogue, the cone type in its final and protected form as shown (looking from the rear) in Fig. 9 and in perspective in Fig. 5, has few superiors.

Referring to Fig. 5, the power is transmitted from the motor M1, utilizing its functioning methods and equalizing the torque variations by means of a well-contrived flywheel of the minimum weight for the desired effect, the same being flanged to the crankshaft and supported by a large main bearing in the crankcase; but the stresses of the flywheel are resisted by a relatively stout chassis frame with channel section side bars B1 and B2 acting in conjunction with a substantial compound cross-bar C1 with diagonal braces D1 and D2 which not only resist diagonal stresses but serve as supports by means of motor arms A1 and A2 for the rear of the motor. The front end of the motor rests upon a cross-bar at one point only so that the scheme of transmission is three-point suspension. A universal joint is placed just back of the cross-bar C1 in a tight housing H1, the joint proper being shown in detail in Fig. 6. The torque of the motor as it is taken from the flywheel by the cone clutch is picked up by the universal joint and transmitted to the propeller shaft in the housing P1, (Fig. 9) and thence to a three-speed selective and reverse transmission gear which is a unit with the live rear axle. There are some refinements of design and construction to be considered in connection with the combination cross-bar C1, the universal joint as shown (in Fig. 6), the yoke Y1 (Fig. 9) and the other schemes for flexibility as shown in the chassis as a whole. At all events the yoke Y1 (Fig. 9) is related to the cross-bar C1 through flexible mountings M2 and M3, which permit the rear wheels to respond to road inequalities enabling the chassis springs to do their part. The tube T1 and its relating members are free in the vertical plane, but are restrained from lateral travel.

Having thus described the relations of the members and their inter-related functions, reference may now be had to the details of the improved cone clutch. As it is shown in Fig. 9 the housing H2 hides the flywheel from sight but discloses the outer rim of the truncated cone around its periphery P1. Instead of using a stout coil spring as the pressing member for the clutch, three separate springs are utilized, one of which is shown as S1. Glancing at Fig. 5, however, these springs show as S1, S2 and S3, and the locking nut N1 on the stubs over which the springs are placed shows in an accessible position so that adjustment of the springs becomes an easy matter for even the autoist of no ex-

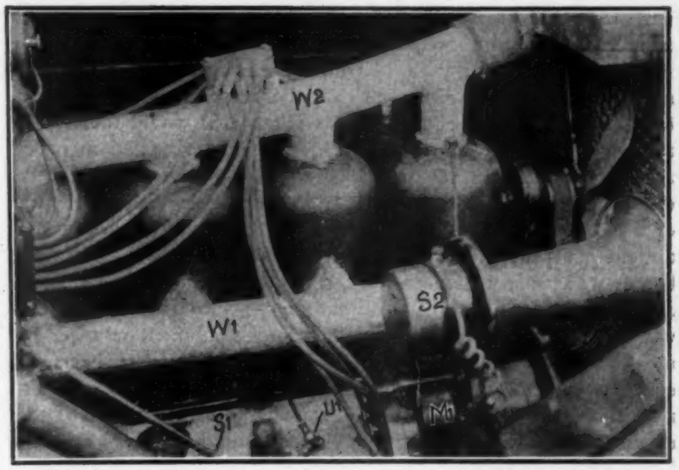


Fig. 8—Presenting the right-hand side of the motor, showing location of magneto, method of wiring, and placing of signal horn

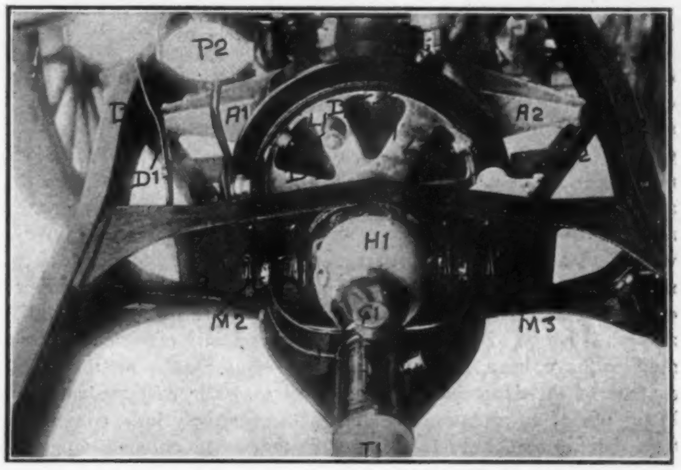


Fig. 9—Looking at the clutching mechanism and universal joint, also the torsion tube yoke and other features of design

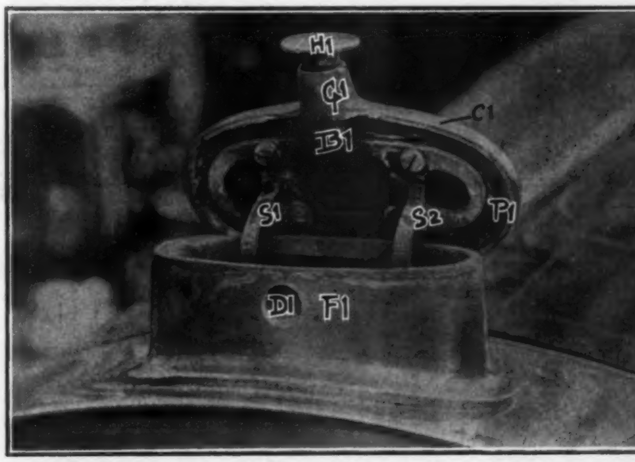


Fig. 10—New form of filler cap on radiator with shape that facilitates filling same, with tight packing and quick release

Fig. 11—Detail of the locking method used on the doors, a study of the leather employed and the excellent utilization of pouches

perience. But it is in just such measures for simplicity that trouble hides quite frequently; adjustment of three separate springs by a man of no skill would be an impossibility were it necessary to have the pressure of the respective springs on a balanced basis. Even an autoist of great skill would find it extremely difficult to make just such an adjustment, and in order that this question of the equalization of the pressure might be disregarded the plan includes a rocking yoke which is slipped over a ball-bearing concentric with the crankshaft extension and the extremities of the three arms of this yoke are provided with bosses which accommodate the members over which the springs S1, S2 and S3 are placed. Without going into further detail it will suffice to say that it is a matter of no moment whether or not the pressure on the respective springs is on a basis of equality, since if one spring is given more tension than another, a reaction takes place through the rocking yoke and a part of the excess pressure is transferred to the remaining members and the sum of the pressures of the three springs is accumulated and utilized in pressing the clutch against the conical face of the flywheel.

There are two points that have long been understood as severe strictures against cone clutches. One of these points lies in the flywheel effect, that is due to the diameter, weight and speed of clutches, which flywheel effect makes it extremely difficult to slide the gears in the transmission system, with the result that the gears are battered up and the autoist is reduced to a state of nervous temper that results in abuse to the motor since the gears are not utilized sufficiently for their intended purpose and the motor is overloaded sometimes until it stalls. At frequent intervals this loading to the point where it indicates to the autoist that if he does not slide the gears the motor will stall, this character of abuse offers but slight indication of a future large repair bill, and yet it is one of the most prolific reasons why makers of automobiles have been reluctant to state what would be the percentage of the depreciation of their wares. The first reform lies in the use of an aluminum spider of an extremely light construction, but in order that "spinning" may be reduced a drag

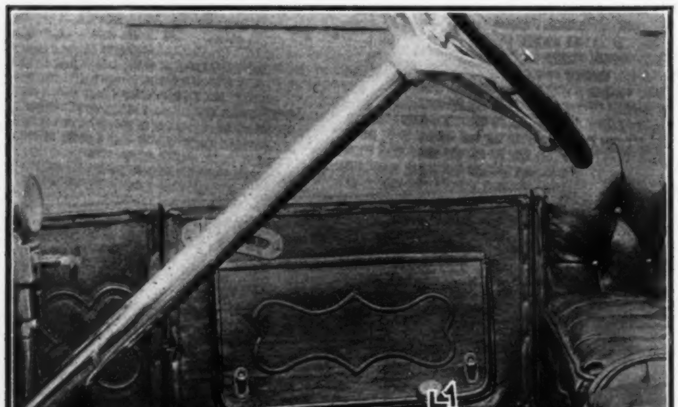


Fig. 12—Looking into the fore part of the body, the left-hand side showing the position of the driver on the right-hand side, free access and the side levers located amidship.

brake D1 (Fig. 5) is placed so that it presses against the face of the clutch around the periphery P1, but the shoe of the drag brake is so contrived and fitted into the receptacle R1 that it requires no attention on the part of the driver of the car. As a further means for introducing delicacy of clutching action and reducing depreciation, six mushrooms are located around the periphery of the clutch, with the heads of the mushrooms pressing out against the facing leather, and the stems thereof are in guides formed in the bosses B3, B4, B5, etc. Under the heads of the mushrooms stiff helical springs are placed and they press against the leather facing exerting 80 pounds pressure. Obviously, this amount of pressure, where there is no limit stop provided, would bulge the leather facing out and prevent the clutch from releasing when it is put through the declutching performance. The particular improvement that eliminates this difficulty is shown in the form of limit stop pins L1, L2 and L3 for each of the stems so that while the springs are capable of exerting 80 pounds each, pressing the mushrooms against the leather, the whole amount of outward travel of the mushrooms is limited to about one-sixteenth of an inch so that the clutch disengages readily and yet the delicacy of the performance is so pronounced that a pressure of less than 20 pounds suffices for the propulsion of the car up a 20 per cent. grade, but the engagement is soft.

Reference was made to the universal joint as shown in Fig. 6 without calling attention to its refinements. Under ordinary conditions it is assumed that the duty of the universal joint is to transmit the twisting moment of the motor taking up angular positions depending upon the variables of the road surface. It is true perhaps that designers recognized the presence of a third inequality which takes on the form of reciprocating motion and a slip joint is generally utilized to compensate for these fore-and-aft variations.

In the new form of joint as here illustrated the telescoping function is performed by the large fluted member F1 with internal driving extensions E1, E2, E3, of which there are four engaging in slots in the mating member F2, which is also fitted with trunnions T3 and T4, working in bearings formed by a pair of rings R1 and R2, which are clamped together by bolts B1, of which there are eight. The yoke Y1 of the universal joint is integral with the sleeve S1 and the whole mechanism is enclosed in a spherical housing that is rendered oil-tight by means of overlapping joints to unit radius. The whole mechanism is packed in a hard lubricant and provision is made for the addition of lubricating material from time to time. The excellence of this joint in service is partly due to the large bearing surfaces afforded to a considerable extent because the trunnions P1 and P2 are in the same plane as the trunnions P3 and P4.

Intelligent Use of Properly Selected Material

The time has arrived in the building of automobiles when the user expresses a preference for the employment of the best materials for the purpose. It is not now a question of the use of alloy steel indiscriminately; it is important to employ the several grades of selected material that respond to the several demands. Fig. 7 is offered as an illustration of the character of steel that must be employed in the transmission gears if they are to serve efficaciously and last as long as the rest of the car. Fig. 7 shows a pinion that was tested to destruction after it was case-hardened. The crevices to be noted in the surfaces of the case are evidences of the fact that the pinion was subjected to an enormous deflection, but since the case failed to peel off it may be known that the bond between the case and the core was sufficiently tenacious for every possible exigency in service. The best indication of the excellence of this material is shown by the the fact that the hub H1 of the pinion A was subjected to such an enormous pressure that it was displaced more than one-fourth of an inch in the axle plane before destruction. B, Fig. 7, shows a gear blank that was deformed by being put under press until it was buckled over and flattened down. The illustration shows that it stood this abuse very well.

This particular steel has a composition as follows: Carbon, 0.28; chromium, 1.00; vanadium, 0.18; silicon, 0.26; manganese, 0.45; phosphorus, 0.02; sulphur, 0.02. This particular material is good for gear work because it presents a glass-hard surface and is possessed of a kinetic core; moreover, the tenacity with which the case adheres to the core is satisfactory for the purpose.

Fig. 13 represents the method of chassis suspension with a three-quarter elliptic spring at the rear, three U-bolts for clamping of the same, shock absorbers stoutly placed and a substantial gusset plate so formed as to support the action of the spring and transfer the reaction to the chassis frame, delivering the same over a broad area.

Body Work Takes an Advanced Position

Referring to Fig. 12 of a fore-door type of body, the steering wheel is located on the right-hand side, but the side levers are placed amidships. This arrangement permits of utilizing two fore-doors and gives the driver free access to the position of steering on the right-hand side of the car. The sliding gears are manipulated by the side-levers L1, the emergency brake lever is shown as L2, the clutch is manipulated by the pedal P1 and the service brakes are actuated by P2.

Fig. 11 is a detail showing the lock on the doors; it is in the form of the arc of a circle bounded by a plate P1 which serves as a guide for a cross-bar type of handle H1, and when the handle is pressed and its extension traverses the slot the motion thus imparted is communicated to a bar lock and the door is securely held in the closed position or it is released for opening as the case may be, all of which is accomplished without marring the smooth exterior of the torpedo type of body involved. An excellent idea of the fine appearance wrought by thus paying attention to the many details will be apparent by examining Fig. 1 of the Model 53 car. Fig. 2 shows the Model 52 fore-door type of car which seats five passengers, and the chassis of Models 52, 53 and 54 is shown in Fig. 3.

The Overland price proposition is especially favorable, as follows: Model 27, fitted with a two-seated body, sells for $1,000; Model 38, with four-seated body, $1,000; Model 40, 35-horsepower, with two, three or four-seated body, $1,200; Model 41, the same car with five-passenger body, $1,300; Model 42, with selective transmission, five-passenger body, $1,400 (the price of this model last year was $1,500); Model 45, with 96-inch wheelbase, low, two-seated body and gasoline tank at rear, $775; Model 46, the same car with two-seated, torpedo body, $850; Model 49 (the same as Model 37, but has selective transmission), $1,095; Model 50, 30-horsepower, with two-seated body, $1,250; Model 51, same with five-passenger body, $1,250; Model 52, 35-horsepower, wheelbase 118 inches, five-passenger body, $1,600; Model 53, same with two-passenger, torpedo body, $1,600; Model 53, same with four-passenger, torpedo body, $1,675.

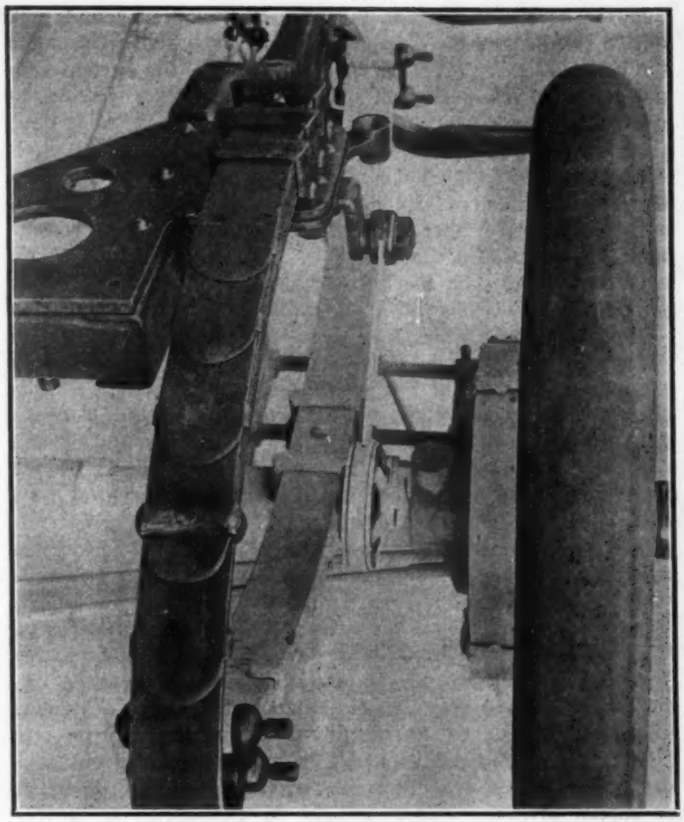


Fig. 13—A portion of the chassis, showing the rear spring suspension and details of carrying the same

Aeroplane Traffic

BY MARIUS C. KRARUP. [CONTINUED FROM LAST WEEK]—THE CHEAP AEROPLANES AND THE PATENTS—PRINCIPAL TYPES OF IMPROVED AEROPLANE MACHINES INDICATED FOR THE IMMEDIATE FUTURE

WHILE there may be dissension with regard to the figures and magnitude of the movement, the preceding analysis of the situation seems to bear out as a reasonable prediction that there is impending a widespread production of small and cheap aeroplanes, and that this production can not be suppressed. And it will be generally agreed without argument that the present development of the costly individual aeroplane, which has already metamorphosed most of the magazines devoted to sports and outdoor life into aeronautical journals and engages from two to ten columns in nearly every issue of the metropolitan dailies, can not be stopped. It must go on in some form. The Alps and the Himalayas, as well as the Atlantic Ocean, must be crossed by the air route before the human mind can declare itself satisfied, once having tasted the delights of jar-less travel through the empyrean and once thoroughly convinced that the physical laws of the universe are friendly and need only be coaxed with a suitable combination of power and insight. If all the aviators tumbled from the skies, one after another, the aviator will still be. *Ruat coelum, impavidum ferient ruinae,* as spoke prophetically Q. H. Flaccus, of ancient memory.

The impending widespread production of small and cheap aeroplanes must rest on the mechanical certainty that it is possible to accomplish at very low cost all that has been accomplished to date at high cost, and even to accomplish, incidentally, a little more, with regard to the safety of the conveyance, than has been offered so far in any one aeroplane machine, and all without exceeding the low cost limit which means popularity.

The coming development of the more elaborate machine, on the other hand, must rest on the necessity for doing much better, the need of much greater safety, much higher speed, much lower speed when required, greater carrying capacity, more comfort; and on the gradual recognition among designers and builders of the proper means to be adopted for these ends. At present, this development must of mental necessity take more than one direction, since all can not at once be made to think alike on the theories of flight, and questions of cost play a subordinate part and exercise little restraint where enthusiasm is coupled with ample means. Judging the immediate future from the immediate past, those who clamor only for more power and fancy that all problems are to be solved by a two-

hundred horsepower engine weighing one hundred pounds will not be satisfied till their proposition shall have been tried out to the limit and every propeller shall have become the circumferential part of a rotary engine; and, no doubt, valuable discoveries will be made along the road of these efforts. At the same time, those others who see more deeply important and practical results in first developing the capacity of the aeroplane for slow travel by a minimum of engine power and in the safeguarding of equilibrium by other means than sheer speed, will continue their efforts, and in the course of time these two schools in aviation will meet on the common ground of obedience to the physical laws—obeying them all, rather than picking out some as important and neglecting others—and the costly individual aeroplane will take one or two standardized forms in which the question of high or low speed will be resolved into a question of the payload which the machine must carry. Between the spell of speed and the warning of danger the development will steer itself by degrees toward the final adoption of one type of flier, and the same type will also be reached by a third route through gradual refinement of the cheap flier of the immediate future and the introduction of economical processes for manufacturing the all-around satisfactory design and construction meanwhile and finally evolved for all. In these generalities all may agree. They cover many possible variations of fliers in the interim. It is, however, the sequence and relative degrees of popularity of the first improved types to be developed which is of greatest interest in this attempt at a reasoned forecast of the immediate future.

Before proceeding to specialize in this respect, the possibilities of interference with a rational evolution through the action of special privilege should perhaps be examined. It is frequently asserted that basic patents will greatly retard the whole growth of the aeroplane industry, and, when this is said, it is usually the patent rights of the Wright corporation which the speaker has in mind. The exactions to be expected from this source are not very likely to become burdensome, however, as any demands falling heavily upon each owner of an aeroplane would be difficult to enforce, and the situation seems to be one in which the industry, as such, may slip from under. Probably "means for varying the angles of incidence of the two sides of an aeroplane" are absolutely indispensable for successful flight, but it is at present not generally believed that this indispensable feature can be monopolized except in conjunction with "means for simultaneously controlling the position of a vertical rudder," and the vertical rudder (which is unknown among animated fliers) constitutes only one of many means for effecting side steering. In the case of the simple and cheap aeroplanes, it may be foreseen that any extraordinary financial pressure upon those wishing to engage in the manufacture will simply result in aeroplanes being made without any of the special contrivances which may be subject to tribute, yet so arranged that these contrivances may be added by the purchaser if they are really required, and it does not seem to be excluded that any device which may be desired by the public might be made by separate firms and openly marketed without conflict with anybody's patent rights, since at worst they would not infringe until placed in combination with the aeroplane machine. If the latter, for example, were made sufficiently supple to admit of warping the planes but not equipped with any device for carrying the warping into effect, it would scarcely infringe. And if the aero-supplies stores were to sell cables and pulleys by which such warping might be easily effected and which, if need be, could also be readily connected with the vertical side-steering rudder, if any such be used, it seems evident that the practical burden of possible infringement could be placed upon the more or less intangible or irresponsible purchaser of the plane, and that all legal proceedings would have to be entered against purchasers individually and severally, with the burden of proof as to the actual employment of the infringing combination resting squarely upon the plaintiff. Between the choice of enforcing the demand for a heavy and onerous tribute in a situation as described and, on the other hand, of reducing the tribute to a minimum to which the manufacturers would be glad to submit, and which would nowise retard the evolution of the new industry, there can hardly be a reasonable doubt as to the result, nor as to the justice of it, since after all the practical flying machine is the product of an age rather than of a man, and one in the profits of which the estates of a considerable number of pioneers might well claim certain shares if justice and legality were one and coextensive ideas, particularly so long as the question is of royalties demanded for a construction feature without which no flying can take place. That the feature discovered last among those indispensable attributes of a machine for flying should be worth so much more commercially than those equally indispensable features and proportions discovered by Lilienthal, Penaud, Ader, Langley, Chanute and others seems to be a concession to legality which there is no reason for making more burdensome to the world than it has to be in order that law and order may be maintained.

If the views expressed are reasonable, it may then be assumed that there is nothing in the present patent situation which will prevent the widespread manufacture of cheap aeroplanes suitable for accomplishing all that has so far been accomplished with aeroplanes of any description or cost, and with regard to desirable new improvements it may be taken for granted that whatever will be added in cost of production through their necessity will carry with it corresponding additions to safety and utility, which in turn will result in greater rather than lesser popularity. With regard to the more elaborate and costly industrial aeroplanes, the cost question, as dependent upon the value and validity of patents, is less clear but also less important. Whatever the laws of the land demand in the form of tribute to established rights will be rendered, but it is already apparent that, unless any method for presenting the main planes of a machine at variable angles to the atmospheric resistance shall be considered by the courts as the property of one concern—and this is scarcely claimed to-day to be a probable result of pending litigation—all existing prerogatives will surely be swept into the industrial clearing house where they may be equitably exchanged against one or another of the much greater number of new prerogatives which are bound to be created from time to time in the further improvement of aero plane construction. The mere fact that the road to industrial perfection of air craft has barely been opened and that commercial results in the end are to be reached by this road only, unless the new manufacture is to be an anomaly in a modern age, precludes the absolute predominance of any one concern, now that thousands are working along the same lines; and the forecast of the probable development may therefore safely be made without reference to the restraining influence of patents.

It should be possible to get a perspective of the prospects by passing in brief review some or all of those facts in the situation which seem to have strongest bearing on the future.

It is known that none of the aeroplanes with whose flight the public is familiar is safe in a turbulent atmosphere. The good paterfamilias whose common sense is extolled in Roman law and held as normal for civilized persons, would not entrust his life to any of them except for very thrifty special cause or in very calm weather. The absence of safety is partly due to lack of natural stability, rendering very quick and skilled control movements necessary in case of disturbance, and partly to the physical impossibility of controlling by rudders unless the machine has speed and this speed (against the surrounding air) is mainly in the direction of the axis of the machine.

The moment cheap aeroplanes are offered the public and give as much safety as the best of the machines now made and exhibited, a much higher degree of safety will be insisted upon in expensive machines. This is a simple commercial law.

Assuming that a safer machine may be constructed, one which a skillful aviator can handle in rough weather, but that the uncertainties arising when the motor is stalled or the aviator gets-

confused still remain, a certain demand for a machine of this order may be counted upon, but it will be confined to sportsmen and professional aviators.

If the continued operation of the motor is assured under practically all circumstances, so that a gliding descent to an uncertain landing place will never or very rarely be required, this will in itself mean a considerable reduction in the requirement for special skill and presence of mind, and the circle of possible purchasers must be correspondingly enlarged, but there will still remain a great majority of good fathers of families who will not shoulder the expense of a costly individual machine or the danger incidental to the acquirement of skill in handling it.

In order to enlist this great majority among the supporters of the coming aeroplane industry, it will be necessary to construct and develop a machine possessing all the qualities of the best individual machines and in which the handling may be given into the hands of a skilled conductor whose natural solicitude for his own safety will guarantee that of the passengers. And in order to have flight under these conditions cheap enough to attract large numbers, it will be necessary to have a large structure capable of accommodating as many persons as may be seated in a street car or omnibus.

If a machine of this construction can be turned out, its use will naturally greatly reduce the number of those who will take the cost and risk of even the best individual machine, if the latter can not offer practically the same guarantee of infallible motor power.

Considering that infallible motor power means not only full assurance of having the motor continue to work for the duration of one trip or journey but also the possibility of maintaining it in perfect order without too heavy a draft upon mechanical insight, and that nothing has transpired in motor manufacture, as yet, to warrant the belief that such a motor, of sufficiently light weight, will be produced within the next five or ten years, the whole situation points in the direction of the large or multiple machine with seating and carrying capacity for many, with the safety of the very best individual motor multiplied by coupling a number of such motors together in the same manner as contemplated in the employment of internal-combustion motors for large marine craft, and with the skill of operating the structure, as well as the skill in caring for it, delegated to specialists.

With a view to industrial enlargement of the aeroplane movement, the pressure for profits from expensive constructions must tend in this direction, and this so much more strongly as the experience gained in safe common carriers must act as a powerful stimulus for removing the hesitations which even game sportsmen will naturally feel against investing heavily in individual machines before the sensations accompanying flight under different weather conditions shall have become somewhat familiar to them without the incurrence of heroic risks. In this respect it seems worth noting that the press has very little to say about flights by the many individuals who have bought aeroplanes in France. It is common report that these mostly remain unused in the sheds.

The mechanical objections to all efforts for imparting automatic stability to relatively flimsy machines supporting a relatively heavy weight have been previously noted and are here for brevity's sake omitted.

The hold which the dirigible balloon has upon popular fancy may be mentioned as pointing to the multiple aeroplane as the form of construction which promises the greatest popular participation in aviation and therefore the greatest industrial development.

Among promoters it seems to have become an axiom that any venture which is based upon the amusement of the many has, as such, the best possible chances for financial success, and from this viewpoint there should then be great encouragement for the building of aeroplanes of the multiple type for use at amusement resorts, provided constructions of this order are possible and safe.

While much more might be said on the subject without exhausting it, it is perhaps already made clear that, industrially, the greatest possible stress in the developments of the immediate future should rationally fall in two different directions, first, toward materializing the small cheap aeroplane mostly based upon past experience and established data and, secondly, toward perfecting the multiple aeroplane capable of carrying many with perfect safety.

The main requirement of the moment must then be a construction which lends itself to the latter purpose. And it is clear that lateral enlargement of aeroplanes of the current types is beset with enormous engineering difficulties and increased troubles in maintaining the balance of the structure. It is also clear that longitudinal enlargement is inconsistent with control by rudders, fore or aft. The supporting planes themselves must be the rudders, that is, the wings must be adjustable. A structure with, for example, six pairs of adjustable wings could not

(Continued on page 509.)

Coming Events

CALENDAR OF FUTURE HAPPENINGS IN THE AUTOMOBILE WORLD THAT WILL HELP THE READER KEEP HIS DATES STRAIGHT—SHOWS, RACES, HILL CLIMBS, ETC.

Dec. 1..........Chicago, Ill., First Annual Aeronautical Exhibition in the Coliseum.

Dec. 31-Jan. 7, '11.New York City, Grand Central Palace, Eleventh Annual International Automobile Show.

Jan 7-14, 1911...New York City, Madison Square Garden, Eleventh Annual Show, Pleasure Car Division, Association of Licensed Manufacturers.

Jan. 16-21, 1911..New York City, Madison Square Garden, Eleventh Annual Show, Commercial Division, A. L. A. M.

Jan. 28-Feb. 4,'11.Chicago Coliseum, Tenth Annual National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Pleasure Cars and Accessories, Exclusively.

Feb. 6-Feb. 11,'11.Chicago Coliseum, Tenth National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Commercial Vehicles, Pleasure Cars, Motorcycles and Accessories.

Mch. 4-11, 1911...Boston, Mechanics' Building, Ninth Annual Show, Licensed Automobile Dealers' Association.

Races. Hill-Climbs, Etc.

Sept. 24..........Belmont Track, Narbeth Race Meet, Norristown Automobile Club.

Sept. 28-30.......St. Louis, Mo., Third Annual National Good Roads Convention.

Oct. 1............Long Island Motor Parkway, Vanderbilt Cup Race, Wheatley and Massapequa Sweepstakes.

Oct. 1............Track, Springfield, Ill., State Fair.

Oct. 3............Louisville, Ky., Reliability Run, Louisville Automobile Club.

Oct. 6-8..........Santa Anna, Cal., Track Meet.

Oct. 7-8..........Los Angeles, Cal., Speedway Meet.

Oct. 8............Philadelphia, Fairmount Park Race, Quaker City Motor Club.

Oct. 14-18........Washington, D. C., Start of Washington Post Reliability Run to Richmond, Va.

Oct. 15...........Long Island Motor Parkway, Grand Prize, Automobile Club of America.

Oct. 15-18........Chicago, Ill., Chicago Motor Club's 1,000-Mile Reliability Run.

Oct. 27-29........Dallas, Tex., Track Meet.

Oct...............Exhibition Auto vs. Aeroplane, Dutchess County Fair, Poughkeepsie, N. Y.

Nov. 3-5..........Atlanta, Ga., Speedway Meet, Atlanta A. A.

Nov. 5-6..........New Orleans, La., Track Meet.

Nov. 10-12-13.....San Antonio, Tex., Track Meet.

Nov. 24...........Redlands, Cal., Hill Climb.

Nov. 24...........Savannah, Ga., Road Race, Savannah Automobile Club.

Foreign Shows and Races

May 1-Oct. 1.....Vienna, Austria-Hungary Automobile and Aviation Exposition.

Aug. 1-Sept. 15...French Industrial Vehicle Trials.

THE AUTOMOBILE

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EDITORIAL DEPARTMENT
THOS. J. FAY, Managing Editor
GEORGE M. SCHELL
JAMES R. DOOLITTLE
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Cable Address - Autoland, New York
Long Distance Telephone - - - - - - - - - - - - - 2046 Bryant, New York

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The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

JUST now the automobile business is undergoing crystallization and the men who have the vigor and the red blood in their veins on a basis to permit them to do men's work are acting in an executive capacity with great efficiency.

* * *

AS in every other walk in life, there is bound to be a certain percentage of the actors who do not occupy the center of the stage, nor are they likely to have a large say in the final settlement of the many important details that are now scheduled for action.

* * *

PERHAPS there is a sprinkling of the character of a citizen who expects to get something for nothing; this class of man casts a reflection on a basis of discredit on the industry and he is hard to get rid of.

* * *

FORTUNATELY the foundation of the automobile industry is absolutely sound; the principal affairs are going along smoothly, but here and there a fester spot is being encountered; this condition is somewhat perturbing to the character of man who would shine as a fine weather sailor.

* * *

SCRUTINY discloses the fact that too little attention has been paid to the limiting of overhead charges; true, profits, instead of having been squandered in Europe, were put back into the plants with the expectation that the foundation will be more secure, and so it will.

* * *

THAT the result is just what might have been expected may be readily understood, but there is a slight plaint based upon the theory that the cost of the purse has made heavy inroads on the fund that incumbered a less pretentious hiding place.

* * *

IF there is anything to be said in despair of the automobile business at the present time, it may be summed up in the simple statement of the fact that there may be a little more raw material on hand than would seem to be absolutely necessary in view of the immediate demand for cars.

* * *

ORDERS are coming in steadily; the public persists in believing in the automobile on a utility basis; the banker who wishes to shine as a moulder of public opinion is proving that he is lacking in luster, and the conservative banker who wisely confines his activities to his legitimate sphere is lending real support to the industry.

* * *

HOW to do without the rumor monger who pesters the automobile landscape is a problem that would seem to be hard to solve were it not for the persistence with which the law of the survival of the fittest goes on its serene way.

* * *

NEVERTHELESS, the temptation to maintain that the law is a little rusty on its hinges is stout in many quarters, and certainly it would be to the distinct advantage of the automobile business were those who circulate baseless stories gagged by a spell of real work.

* * *

BUT success is more gratifying if it is seasoned with adversity, and while it is admitted that the peppery ingredients are ever present, it is impossible to hide the splendid measure of success that the automobile business is enjoying, the half of which lies in the ample evidence of growing volume that may be seen on every hand.

* * *

FROM now on it is reasonable to expect that bombast and the gamut of pyrotechnics will occupy a fitting niche in a well-designed and efficient cold storage plant while the real makers of automobiles will render their stagnated materials liquid and entertain solvency as an honored guest.

* * *

THERE is some talk about the restriction of 1911 output, but it is not well founded unless it is amplified; the ban is on hastily-made product; the volume of business as measured in dollars will be greater than it was last year by perhaps one-half.

* * *

THE main chance for making a serious mistake lies in not appreciating the keenness of the automobile public; it knows what it wants; if fore-door types of bodies, for illustration, are better than the other kind, the automobiling public will come to a full realization of the fact and it will go hard with the maker who disagrees with merit and a learned clientèle at the same time.

A.L.A.M. Sues Importers

TAKES AGGRESSIVE STAND AGAINST MORE ALLEGED INFRINGERS OF SELDEN PATENT, ASKING DAMAGES AND SEEKING INJUNCTIONS IN FEDERAL COURT

FOLLOWING the recent progressive steps in the Selden patent litigation, the A. L. A. M. has assumed an aggressive position with relation to further action. Suits for damages and profits arising out of alleged infringements of the Selden Patent and asking for injunctions against eighteen importers and dealers in foreign cars and the Fiat Automobile Company of Poughkeepsie, all of whom are not included within the list of licensees under the patent, have been filed and an additional number has been prepared upon which service has not yet been made.

The recent decree of Judge Hough, of the Federal Circuit Court of Southern New York, was directed mainly against the Ford Motor Company and Panhard and Levassor Company, but the action of the court was suspended in each case, after a bond of $350,000 had been filed by the former and one for $16,000 by the latter company.

While the suits against the defendants named have not been prosecuted to a conclusion, the decree filed by Judge Hough was final as far as three other defendants are concerned and it is in line with that phase of the decree that the present batch of suits is filed.

Under the complaints, the defendants are commanded to answer on or before October 3.

The ultimate hearing of the original suit, which has been appealed to the Court of Appeals, is set for the coming term. An adverse decision to the cause of the A. L. A. M. would overset not only the cases that have been appealed but would also nullify the action taken against the importers in this series of suits and those contemplated in the immediate future.

On the other hand, a decision sustaining the position of the A. L. A. M. would serve to make easy the course of prosecution in these cases.

The announcement is made officially that the A. L. A. M. is preparing another list of makers and dealers against all of whom similar suits will be commenced.

Among the companies that have already been served, with the cars they handle, are the following: S. P. O. Automobile Company (S. P. O.); Itala Import Company (Itala); Albert C. Otto (Saurer trucks); Fiat Automobile Company (Fiat); C. G. V. Import Company (C. G. V.); Delahaye Import Company (Delahaye); Zust Motor Company (Zust); Benz Auto Import Company (Benz); Hotchkiss Import Company (Hotchkiss); Daimler Import Company (Mercedes); Henry Ducasse & Company (Darracq); Renault Frères Selling Branch (Renault); Saurer Motor Trucks (Saurer trucks); Albert C. Travis (Mercedes); Healey & Company (Mercedes); Fiat Company of Poughkeepsie (American Fiat); A. T. Demarest & Company (English Daimler); J. M. Quinby & Co., Newark, N. J. (Isotta).

Wisconsin Court Hears Velie Suit

MILWAUKEE, Sept. 19—The Supreme Court of Wisconsin heard arguments late last week on a motion of the defendants in the $500,000 conspiracy suit brought by the Velie Motor Vehicle Company for a writ of prohibition to prevent Judge W. J. Turner, of the Circuit Court for Milwaukee County, from assuming jurisdiction in the matter. The case was taken under advisement.

Judge Turner recently dismissed the cases against twenty of the defendants by stipulation, holding four, of which number one was subsequently released. The remaining defendants are: Pope Manufacturing Company, Chalmers Motor Company and the Locomobile Company.

These defendants ask for a writ of prohibition, claiming that as service was made upon the Wisconsin sales representatives of these concerns, the foreign concerns have not received legal service of the complaint. The twenty-fifth defendant, the Kopmeier Motor Car Company of Milwaukee, a retail selling agency, is not concerned in the demand for the writ of prohibition. The Kopmeier company's demurrer was recently upheld, halting proceedings temporarily.

Variation in American Automobile Prices Since 1903

The Association of Licensed Automobile Manufacturers has just made public a most interesting tabulation in connection with the industry. It is a chart showing the variation in the average price of motor cars from 1903 until the present time. The reduction shown since 1907 is brought about by the great increase in the manufacture and sale of machines selling at $1,500 or less. The sales recorded by makers licensed under the Selden Patent are for American gasoline automobiles only. By comparison the sales of steam and electric vehicles are small.

The following comparative table indicates the average price for each year, including the first six months of 1910:

1903 Average price	.....$1,133.37	1907 Average price	.....$2,137.56
1904 " "	..... 1,351.45	1908 " "	..... 1,926.94
1905 " "	..... 1,609.79	1909 " "	..... 1,719.93
1906 " "	..... 1,853.93	1910 to July 1st	.... 1,545.93

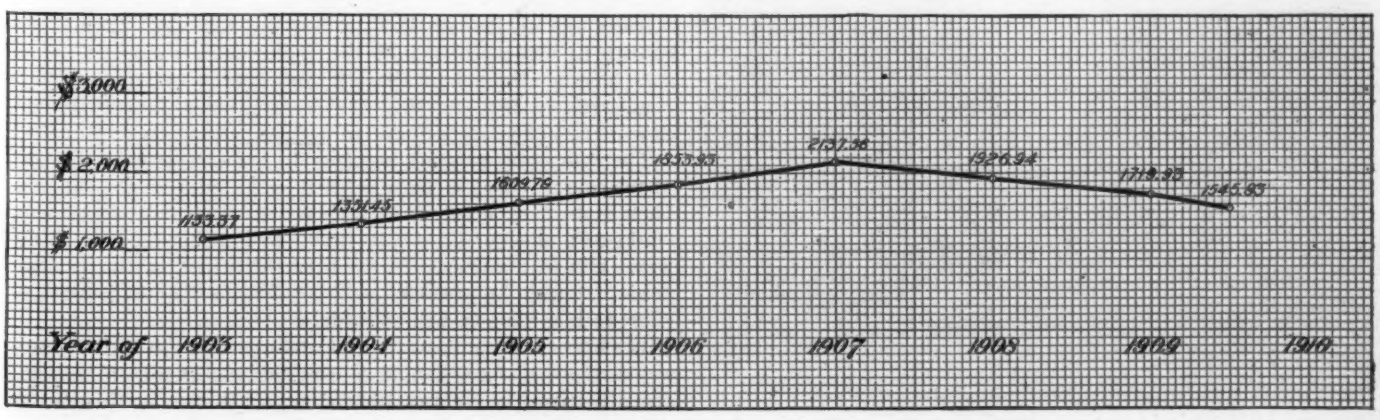
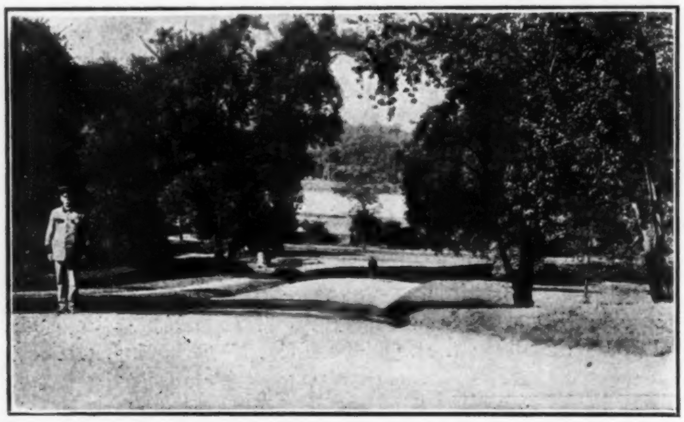


Diagram showing the fluctuation in the average price of American automobiles from 1903 to date

Home stretch—grand stand will be on right, press stand on left



"Dare-Devil Dip" down to the West River Drive

Under Strawberry Bridge on West River Drive

Where the flyers will make up time on the river drive

The Fairmount Park Race

ONE of the richest prizes, one of the most characteristic of all the American road races and one of the most spectacular and unique events of motordom is the Fairmount Park 200-Mile Road Race of the Quaker City Motor Club, the third renewal of which is scheduled for October 8, one week after the Vanderbilt Cup event has been decided.

The money prizes hung up by the club this year total $6,500 and in addition there are numerous rich awards of plate and cash. The field this year will be divided into five classes under divisions 2, 3, 4, 5 and 6-C, which will allow any gasoline car or chassis made by a factory that has turned out at least 50 cars within the past twelve months, not necessarily of the same model and which measure from 161 to 750 cubic inches piston displacement, without minimum weight restrictions, to enter the race.

As the Vanderbilt Cup entries are restricted to cars measuring from 301 to 600 cubic inches, it will be seen that the field of the Fairmount Park race may include both larger and smaller cars than the ones that try for the Long Island crown.

On the face of the proposition it might seem that the admission of the big racing machines was unfair to those of smaller power, but it should be remembered that the course is exceedingly tortuous and that there are no long straight stretches upon which the big road engines' advantage in power would be emphasized. Then, too, there is a class prize of $1,000 offered in each division for the car that makes the best time in competition with those of similar power.

The entrant that makes the full course in the fastest time will win the grand prize of $2,500, and also its class prize of $1,000 and besides a number of other valuable prizes.

There will be no second, third and fourth money hung up by the club.

On account of the location of the race course, adjacent to the city of Philadelphia with population of over a million and a half, the attendance will undoubtedly be immense. In 1908 the estimated attendance was 400,000 and last year the figures were greatly increased.

With the broadening of the conditions of the race, which has been aimed to bring down a larger field of faster cars than ever before, the interest in the race will be intensified and preparations are being made to provide for a crowd approaching the million mark.

The start of the race will be made at noon and the cars will probably be sent away on 15-second intervals, the same as last year. Under the modified ruling of the Contest Board, the field may consist of thirty cars, and, as the race has filled to the limit on each of the two former occasions, it is to be assumed that the starters will number somewhere near the limit set. Owing to a change in the conditions of the race, which allowed Class C cars to enter instead of Class B, the entries so far have been comparatively few, but they are reported as coming in rapidly now. The entry box will not be declared closed until October 3.

The competing cars are required to make twenty-five circuits of the course, which is approximately eight miles long. The park boulevards over which it is laid are so wide that about two-tenths of a mile per lap can be cut off by hugging the pole all the way. Out in the middle of the road the circuit is exactly eight miles. It may be predicted with confidence that a determined effort to hug the pole will be made.

The history of the event is brief and glorious. In 1908 the race was confined to American-made cars and was won by a Locomobile 40, driven by George Robertson. Last year a Simplex 90, driven by the same pilot, scored a rather easy win from twenty

PREPARATIONS FOR THE THIRD ANNUAL RENEWAL OF THIS CLASSIC EVENT ARE NOW WELL UNDER WAY—FIELD OF ENTRIES WILL BE LARGE

other competitors. The time made in the Fairmount race is never fast as compared with that made on several other road courses. The winners in the past have only approximated 50 miles an hour. This is the result of the winding course, lack of straightaways and the presence of several stiff grades. It is thought that the record for the race will be set at a higher mark this year, some drivers talking of a mile-a-minute speed.

Starting on the level South Concourse, the course takes a sudden shoot down the tortuous Sweet Briar Hill to the level of the Schuylkill at the West River Drive. Then comes a three-mile level, following the windings of the river to Neill Drive, where a left turn up the long grade carries the racers to the high ground on City Line road, and thence by a left turn into Belmont avenue. This broad thoroughfare is followed around the base of George's Hill and thence to the head of the stretch.

The committee of citizens acting with the Quaker City Motor Club and headed by Mayor Reyburn as chairman has extended a formal and cordial invitation to President William H. Taft to be the guest of honor during the race. If the President accepts the invitation he will be met at the Broad Street station and escorted to the course by a civic committee, the First Troop Philadelphia City Cavalry and a squad of police. The grand stand, in which the Presidential box is already being planned, will be situated in West Park, just south of Memorial Hall.

From October 3 until the morning of the race the course will be closed to traffic between the hour of dawn and 7 a. m. so that the contestants may familiarize themselves with the route.

One of the features of the race is the fact that half the receipts are donated to charity. In the past the amount turned over to work of this kind has amounted to about $10,000 a year. The city officials act in intimate conjunction with the officers of the Quaker City Motor Club and Mayor Reyburn, Henry Clay, of the police department, and representatives of the various charitable organizations that enjoy benefits on account of the race and the following delegation of clubmen form the executive committee in charge of the enterprise: Frank Hardart, L. D. Berger, Fred C. Dunlap, A. T. James and G. Hilton Gantert.

The following institutions are beneficiaries and participants in the funds raised on account of the race: Home of the Merciful Saviour for Crippled Children, Playground Committee, Mount Sinai Hospital, St. Mary's Hospital and the Police Pension Fund.

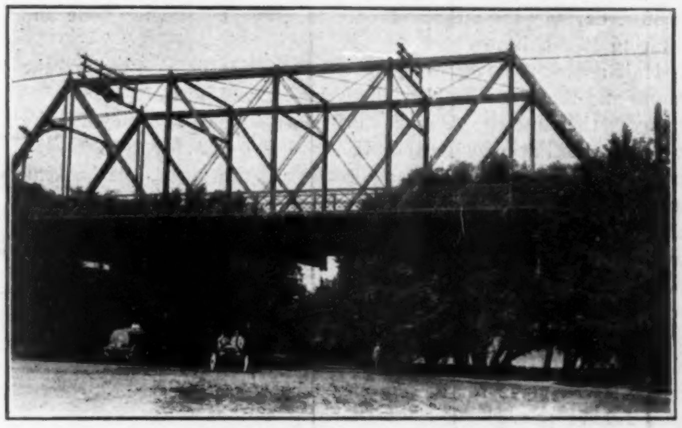
Up to the present, which leaves a margin of eleven days before the closing of the entry box, the entered cars are as follows:

Car	Entrant	Driver
Alco	American Locomotive Co.	H. Y. Grant
Chadwick	Chadwick Engineering Co.	Len Zengle
Chadwick	Chadwick Engineering Co.	Al Mitchell
Benz	Benz Auto Import Co.	George Robertson
Benz	Benz Auto Import Co.	Ed Hearne
Apperson	Apperson Bros. Auto Co.	H. M. Hanshue
Jackson	Jackson Automobile Co.	E. F. Scheifler

The officers who will have charge of the race include the following: Honorary referees, John E. Reyburn and S. M. Butler; representative of the Contest Board, P. D. Folwell; referee, R. E. Ross; judges, Charles J. Swain, L. D. Berger, G. Douglass Bartlett; chief timer, Paul B. Huyette; scorer, W. C. Jackson; starter, G. Hilton Gantert; contest committee, R. E. Ross, G. Hilton Gantert, Fred C. Dunlap, A. T. James, A. E. Maltby, George M. Graham, Paul B. Huyette, Evans Church and Joseph L. Keir; technical committee, Percy C. Colket, C. Stead and Harry A. Lewis; clerk of the course, Joseph L. Keir; announcer, Clarence W. Cranmer and the racing secretary, Harry C. Harbach, secretary of the Quaker City Motor Club, who has charge of all the details of preparation and execution for the event.

Straight course after leaving the Strawberry Bridge

Under the B. and O. bridge just before leaving river drive



Where the Reading Railroad crosses the course at Belmont

Back of George's Hill, before reaching the stretch

Vanderbilt Cars Practice

FAST WORK DONE BY CUP ASPIRANTS AT OPENING OF COURSE. ENTRY LIST NOW CONTAINS TWENTY-TWO CONTESTING AUTOMOBILES

PRELIMINARY practice for the Vanderbilt Cup Race commenced Tuesday morning at dawn over the cup course on Long Island. Prior to the formal practice, the Lozier aspirant was run over the route a few times by Ralph Mulford, but nothing like high speed was attempted as the county roads were not closed at that time.

Five more entries for the Vanderbilt Cup have been received as follows:

Car	Entrant	Driver
Jackson	Jackson Auto Co.	E. F. Scheifler
Corbin	Corbin Motor Veh. Co.	Joseph Matson
Amplex	S. J. Wise & Co.	Walter Jones
National	Poertner M. C. Co.	L. A. Disbrow
Stoddard-Dayton	U. S. Motor Co.	Tobin De Hymel

Total entry list to date, 22 cars

The Mercer entry to be driven by E. H. Sherwood, announced for the Massapequa Sweepstakes, has been transferred to the Wheatly Hills Sweepstakes and a Corbin to be driven by Alvin Maisonville has been entered in the Wheatly Hills. An S. P. O. car, entered by Thomas N. Cook, to be driven by Jean Juhasz, and a Correja, entered by J. Mora Boyle, have been added to the entry list of the Wheatly Hills Sweepstakes. The Abbott Motor Company has entered three cars in the Massapequa Sweepstakes. A Lancia, which will be piloted by William Knipper has been entered in the Massapequa Sweepstakes.

Just at daybreak Tuesday morning, the roar of a racing motor was to be heard off to the westward of the grandstand as A. R. Pardington and a party of officials reached the stand. Presently in the gray dusk a swift-moving drab streak appeared upon the distant hilltop and in another moment the Amplex, two-cycle motor, darted past the stand with throttle and muffler wide and roaring like a lion.

Half a dozen watches snapped as the driver nodded toward the stand and the first official trial of the practice was on.

From the time the Amplex disappeared from view beyond the turn in the Parkway until it had rounded the far turn to the northwest and started back again toward the stand, the barking engine was clearly to be heard. Then for about thirty seconds the sound was lost, only to be picked up again as a throbbing against the eardrums when the machine topped the far hill and headed for the line. With a rush and a swirl like the explosion of machine-gun shells in a thicket, the car passed the stand again.

It seemed as if it must have done remarkably fast time from the amount of noise made and apparent speed, but the watches only showed 11:52 for the circuit. That rate of speed, however, would have proved sufficient to have won in other Vanderbilt Cups if maintained from start to finish.

The next aspirant for speed honors was the Simplex, driven by Mitchell. A broken spring-clip prevented anything sensational in the way of a trial, as the driver eased the car along and made the circuit in 12:18 according to announcement.

The second trial proved the end of the practice for the day, but on Wednesday morning half a dozen of the entered machines will go through their paces. The Benz trio, the two Simplexes, the pair of Marmons, the Apperson, two Corbins and the Lozier are on the ground and ready to commence practice.

The course is patrolled from 5 a. m. to 8 a. m. by a squad of flagmen stationed at every crossing and every doubtful spot on the route. The guards are equipped with a red flag and a white flag. The white means danger to the speeding contestant and the red means danger to the public and safety to the driver.

The course is practically in racing shape. The oil treatment of the county roads this year consisted of 1,500 gallons to the mile and will not be repeated before the race. One good rain is needed to put the roads in ideal condition and the weather appearances favor at least that much precipitation.

The start of the Vanderbilt Cup has been advertised for 5 o'clock sharp, but by October 1 it will be stone black at that hour and it is likely that the first car will not be sent away until about 6 o'clock. The Vanderbilt entries will be dispatched at ten second intervals and one hour after the last of the cars is sent on its long dash, the first of the Wheatley Hills entries will commence its race. After the contestants in that event have started, there will be another lull for a half hour and then the contestants for the Massapequa Sweepstakes will be called to the post. The idea is to hold the interest and attention of the crowd until the finish of the race and to provide a powerful motive for keeping the course clear until practically all the cars in the three events have passed the line.

If the plans work out as intended, it is not unlikely that the winning cars in the three contests will finish in the same lap. This of course contemplates fast time by the Vanderbilt winner, but external appearances seem to favor some exceedingly rapid work in that class.

The telautograph will be used in disseminating information from the stand to the scoreboards, there being one transmitting instrument and seven receivers in process of installation at present. The process of scoring will be augmented by the use of this instrument. The timers will hand the scores to the operator who will send them direct to the board markers. On either side of the press stand giant frames are being built to hold the boards, and the system of marking that will be used allows the operator to place the lap figures in appropriate squares behind the board and without obstructing the view from the grandstand, to display the figures on the face of the board.

The Warner timing instruments will be installed by Friday morning, when it is expected that all the contesting cars will be in camp.

There was a heavy fog over the Vanderbilt Cup course Wednesday morning when day broke and for a short time it looked as if practice would have to be postponed. But about 6:30 o'clock the fog lifted and in a short time one of the Pope-Hartford cars came down to the line with everything drawing alow and aloft and Bert Dingley at the wheel. The racy-looking white car flashed by the timers and was gone in a jiffy proceeding over the full course and finishing the lap in 11:21, which is the fastest time made in practice so far this year.

The Simplex (Mitchell) made a round in 11:41 and the other Pope-Hartford entry was also out. The Marion, entered in the Wheatley Hills, was given a spin by Basle at moderate speed.

Good Roads Convention Draws Interest

Interest in the Third National Good Roads Convention which will assemble in St. Louis, September 28 and remain in session for three days, is as wide as the country. While the proceedings and deliberations will be of more direct value to the Southwest than any other general division, the convention will be attended by big delegations from Massachusetts, Colorado, the Pacific Coast, Gulf Coast States and from nearly every other quarter of the land.

The program includes a series of addresses that will go to the root of road construction of the most advanced type. Among the speakers are the following: N. J. Batchelder, master of the National Grange; Charles S. Barett, president of the Farmers' Union; C. O. Raines, master of the Missouri State Grange; and a dozen other leaders of thought and action on the subject of good highways.

1911 Cars at Detroit

AUTOMOBILE SHOW AT THE MICHIGAN STATE FAIR MARKED BY THE FIRST APPEARANCE OF MANY OF THE COMING YEAR'S MODELS

DETROIT, MICH., Sept. 19—Never, in the history of the Michigan State Fair, has the gasoline motor had such a representation or played so conspicuous a part as this year. The opening of the 1910 fair also marked the opening of the new automobile building, a handsome, two-story brick structure, 125 by 275 feet, with a floor space of more than 68,000 square feet. Nearly all of the space is occupied and the opening found most of the exhibits in place.

Following is a list of the exhibitors:

Security Auto Co., Olds Motor Works, Lion Motor Sales Co., Maxwell-Briscoe-McLeod Co., Ford Motor Co., Anderson Carriage Co., Cadillac Motor Car Co., Detroit Motor Sales Co., Herreshoff Motor Car Co., Brush-Detroit Motor Car Co., Elmore Auto Co., Cartercar Co., J. P. Schneider, Overland Sales Co., Van Dyke Auto Co., Cass Motor Truck Co., Port Huron; Keeler-Hupp Motor Co., Montgomery Motor Sales Co., Winton Motor Carriage Co., Grabowsky Power Wagon Co., Rapid Motor Vehicle Co., Buick Motor Co., Regal Motor Car Co., C. B. Fear, J. H. Brady Auto Co., W. A. Patterson Carriage Co., Flint, Mich.; Standard Oil Co., Atlantic Refining Co., Cleveland; Auto Supply & Manufacturing Co., Searchlight Gas Co., Pittsburg; Auto Equipment Co., Eastern Rock Island Plow Co., Indianapolis; Flint Wagon Co., Gillespie Auto Sales Co., Jackson Motor Co., Jackson, Mich.; Michigan Magneto, Portland Cement, Emil Grossman Co., New York; Manson-Campbell Co., Wayne Oil Tank & Pump Co., Seitz Auto & Transmission Co. and the Craig Auto Co.

Saturday has been set apart as Automobile Day at the fair and a great racing card has been arranged by the Wolverine Automobile Club, which will have full charge of this feature of the big show.

Buick Financed; Nash Is Manager

Definite announcement of the success of the Buick Motor Company in negotiating a loan of $2,500,000 to provide working capital for the coming year's business has been made. Boston capitalists were interested in the financial plans of the company and it is understood that the matter has been arranged on a permanent basis by the sale of bonds rather than by the floating of short time notes or certificates.

The big plant at Flint, which has been shut down, will be run at its full capacity under new management. Charles W. Nash, who has been general superintendent for several years, will be the general manager. The production for 1911 is estimated at 18,000 cars.

Hartford Tire Men in Convention

The three-day conference of the field representatives and branch managers of the Hartford Rubber Works Company terminated in a dinner at the Shoreham at Morris Cove, New Haven. Those present at the convention were: Justus D. Anderson, president; Harry E. Field, vice-president; E. S. Benson, secretary; J. P. Keough, treasurer; C. B. Whittlesey, superintendent of the works; John Shea, master mechanic; Franklin Kesser, sales manager; D. W. Pinney, assistant treasurer, M. C. Stokes, motorcycle tire department; Charles Clark, motor tire department; W. H. Reed and A. E. Martel, solid tire department; Guy Turner, repair department; Fred Appleton shipping department. The following branch managers were present: E. S. Roe, New York; W. H. Barnes, Philadelphia; Charles Langmaid, Boston; O. S. Johnson, Buffalo; P. H. Goodall, Cleveland; H. Severance, Detroit; A. W. Kirk, Atlanta; W. H. Powell, Chicago and the following salesmen: A. D. Cruden, Harry Snyder, E. H. Fahey, and W. Brown, New York; G. D. Niles, L. C. Havener, L. Frohock, Boston; E. H. Johansen, J. R. Hoffman, E. L. Duffie, and H. V. Koons, Philadelphia; S. N. Keller, Buffalo; H. B. McIntosh, Thomas McClurg, Cleveland; J. H. Tompkins, Detroit; P. B. Simmons, H. E. Smith, G. R. Noble, G. H. Wright, W. W. Clark, Chicago; E. S. Edwards, J. Morgan and C. P. Towne, Connecticut.

Commercial Vehicles in New York Run

Under the management of the New York *American*, a commercial vehicle reliability test will be held in the metropolis October 28 and 29. The course of the run will be over various streets of New York and aside from mechanical ability to maintain a fixed schedule of speed, the test will include economy of operation.

Up to date four entries have been made as follows: Morgan, five-ton truck; Gaggenau, seven-ton truck; Garford, two-ton truck and Renault, two-ton truck.

Aeroplane Traffic

(*Continued from page* 503.)

be conceived as of the biplane type. It must be a multiple monoplane with the wings tandem in pairs. In early experiments tandem construction was found ungovernable, but the planes were rigid, the control by rudder. In fact all aeroplanes have been more or less ungovernable in puffs of wind. All types known have at times been bumped off their equilibrium by atmospheric disturbance. Hence the aeroplane of any type, individual or multiple, needs "springs" or "shock absorbers," even though it floats on air. On second thought it is indeed self-evident that a medium which smooth (that is, calm or steady) supports a half-ton as on asphalt or better, will be capable of jolting the same half ton when rough (that is, puffy). The multiple aeroplane must have "springs"; that is, its adjustable wings must have flexible elements in them. These much elongated structures which it is possible to foresee, if the aeroplane is to have a strong industrial future, will have a much improved stability, as the weight and the propeller shaft may be placed considerably below the level of the air resistance, by reason of the elongated shape, in the same manner as with dirigible balloons. And they can not fall endwise by gravitation; no more than a wooden stick can fall endwise unless it is loaded endwise or twirled.

A description of a multiple aeroplane on the plan indicated would be too long for this article, but it is already seen that a construction of this order is wanted for an industrial development and that it presents no difficulties which can not be surmounted the moment control by adjustable wings is realized in practice; in fact, that it is a simpler engineering problem to construct a multiple aeroplane which can be operated with safety than an individual aeroplane of equal merits. As soon as the combination of adjustable main planes with the required strength and the required weight limit shall have reached the practical solution upon which many engineers are working, the multiple aeroplane available for amusement resorts and as a common carrier should for all the reasons mentioned become one of the most conspicuous elements in aeroplane evolution, and the forces tending in this direction seem so strong as to render it reasonable to expect results in a very near future.

Short News From Everywhere

ITEMS CULLED HERE AND THERE FOR QUICK READING—TRADE AND GENERAL INFORMATION

—The Automobile Equipment Company is now handling the Kissel Kar in Baltimore. The firm is located at 2207 Madison avenue.

—The Woods Motor Vehicle Company has established a St. Louis branch, which will be housed in a new building at 425 North Euclid avenue.

—The Cole "30" is being marketed by the Hartford, Conn., Motor Car Company of which G. P. Barinard and W. N. Smith are the prime movers.

—F. Sheffield, of Shaniko, Ore., left for the Hawaiian Islands the past week, where he expects to handle the Winton car in Honolulu and vicinity.

—The Fisk Rubber Company has recently opened new direct factory branches in Providence, R. I.; Rochester, N. Y., and Oakland, Cal. This makes twenty Fisk branches.

—Formal announcement has been made that Will F. Lipman, of Lipman, Wolfe & Company, has bought the Portland Taxicab Company and will reorganize and enlarge the concern.

—The Detroit Auto Dealers' Association has decided on the time for next winter's annual show. The event will be held at the Wayne Gardens, as in the past, the dates being January 15-21.

—The H. W. Johns-Manville Company of New York has opened an office at Atlanta, Ga., which is in charge of W. F. Johns. Another branch office has been located at Rochester, N. Y., in charge of H. P. Domine.

—The Haynes Automobile Company, of New York, has opened a branch office in Newark, N. J., at 261 Halsey street. C. R. Schuyler, who for the past five years has been with the Buick Motor Company, of Newark, is manager.

—The Portland Livestock and Fair Exposition was opened the past week with a monster automobile parade headed by Acting Governor Bowerman and followed by the entire Portland Automobile Club in several hundred handsomely decorated cars.

—At a meeting of the executive committee of the National Gas and Gasoline Engine Trades Association, held at Racine, Wis., arrangements were completed for the next convention of the association to be held in that city, December 12 to 15.

—The Hudson Motor Car Company of Detroit has increased its capital stock from $100,000 to $1,000,000 and the announcement is made that it will divide the major portion of the new issues among the stockholders of record in the shape of a stock dividend.

—Between fifty and one hundred members of the Adcraft Club of Detroit are preparing to motor to Rochester next month, when the advertising affiliations made up from Detroit, Cleveland, Buffalo and Rochester will hold an adfest in the latter city.

—Under the management of Keith L. Goode, an American, who has resided in Paris, France, for 15 years, the Diamond Rubber Company has opened a branch in Paris for the supplying of Diamond tires to Americans motoring abroad and to the French trade.

—The American Locomotive Company has announced that a new model motor truck of five-ton capacity is to be added to the Alco line. The five-ton trucks are expected to be ready for delivery in a few months. The full 1911 Alco line will be announced shortly.

—Announcement has just been made that the Howard Automobile Company, which formerly distributed Buick cars in Oregon through the agency of the Northwest Buick Company, is to establish a branch in Portland for direct distribution. This branch will be under the management of Mel G. Johnson.

—It has been decided by the Pacific Coast Underwriters' Association to discontinue the requirement charging the building rate for automobile risks when it exceeds the automobile rate of 2 1-2 per cent., and to adopt in its place a flat rate of 2 1-2 per cent. for all models of the current calendar year and 3 per cent. for cars of other models.

—The Automatic Windshield Company, of Detroit, was consolidated recently with the Superior Mfg. Company, of Ann Arbor, Mich. This change is only nominal, for the two concerns have really been joined since the organization of the Windshield Company. The Superior Mfg. Co. has done the manufacturing, and the Automatic Windshield Company has been the selling organization.

—The Pope Manufacturing Company has been flooded with acceptances of the company's invitation to the Pope-Hartford owners to be its guests at the Vanderbilt cup race and judging from present indications there will be a big delegation in the Pope camp. Two large tents will be erected at the course for the comfort of those who come and a luncheon will be served by the company.

—The Leominster, Mass., Automobile Club was organized a few nights ago with a charter membership of 57. It has joined the Massachusetts State Association. The following officers were elected: W. H. Chase, president; A. H. Hall, vice-president; Murray C. Damon, secretary-treasurer; George P. Jones, Alfred M. Litch, Charles H. Howe and John Pickering, directors. President Chase was nominated as the representative of the club at the State and national meetings.

—The Worcester Licensed Automobile Dealers' Association, as a result of the recent success in the first out-door auto show held at the New England Fair, is planning to hold during the coming Winter the first indoor automobile show ever held in that city. The scene of the show will be in the new Worcester Auditorium building, now nearing completion and which will have the largest floor space of any hall or building for expositions in New England, with the exception of Mechanics' Hall, Boston.

—The following agencies for the Parry car have been installed recently: Austin Motor Car Company, Austin, Tex.; Auto Exchange, Vicksburg, Miss.; Auto Sales Company, Cleveland, Ohio; Bennett & Covington, Clio, S. C.; E. L. Cooper, Coates, Kan.; Ed. Dickinson, Shreveport, La.; Ellett & Nilson, Bartow, Fla.; Charles L. Fisk, Middletown, Conn.; Hobart Motor Company, Hobart, Okla.; Irving Garage Co., Washington, D. C.; L. S. Mitchell Auto Company, Chattanooga, Tenn.

—J. E. Levi & Company, who have until recently handled the Reo and Premier in Atlanta, have been succeeded by the Reo Motor Distributing Company. This organization has a larger territory, handling the Reo in all of Georgia and part of Alabama. Just how much territory they will handle for the Premier has not been decided as yet. R. C. Smith, vice-president of the company, may also handle the Oakland in some Atlantic Coast States. The officers of the new company are H. E. F. Jones, president; R. O. Smith, vice-president; G. F. Tumlin, secretary and treasurer.

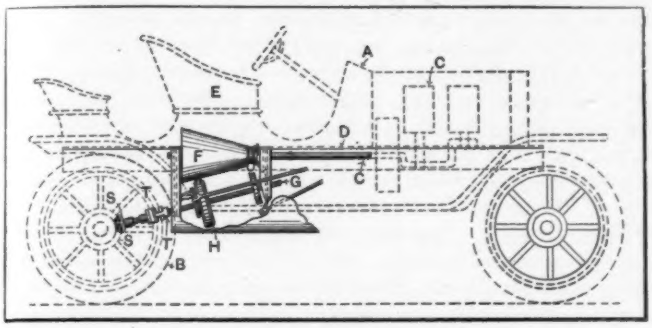
—The Rogers Motor Car Company of Omaha, which has recently begun making motor cars, announces that its plant will be enlarged to a capacity of 5,000 cars annually. The present output of the company is 900 cars a year. C. A. Ralston of Chicago, formerly vice-president, becomes general manager of the company in place of Ralph Rogers, who remains on the board of directors and will be special designer for the company. An addition of brick, three stories high, 300 feet long and 60 feet wide, will be built.

Patents Gone to Issue

DESCRIPTIONS OF A NEW DRIVING GEAR; NOVEL FORM OF WATER JACKET; A SPARK-PLUG—GIVING THE PRINCIPAL CLAIMS FILED IN THE PATENT OFFICE THEREFOR

968,521. DRIVING-GEAR FOR MOTOR VEHICLES. Walter Baird, Pittsburg, Kan. Filed Oct. 24, 1908. Serial No. 459,419 (six claims).

4. The combination, with a vehicle, having a seat, an engine mounted upon the vehicle body in front of said seat, and a



Driving gear for motor vehicles

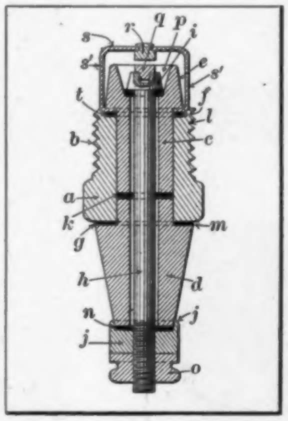
conical drum extending into the space beneath said seat and having its smaller end nearest the engine, of means intermediate the engine and drum for driving the drum, a friction roller in contact with the under surface of the conical drum, a driven shaft on which said friction roller is splined, means for shifting said friction roller along said driven shaft, means for moving said shaft toward and from said drum, means for driving the rear wheels of the vehicle from said driven shaft, and a flexible connection in said driven shaft between the friction roller and the means for driving the rear wheels.

968,545. WATER JACKET FOR EXPLOSIVE ENGINES. John F. Dodge and Horace E. Dodge, Detroit, Mich. Filed Sept. 1, 1905. Serial No. 276,693. Renewed June 3, 1910. Serial No. 564,854 (six claims).

2. The combination with a cylinder having a flanged head, of a relatively thin sheet metal water jacket embracing the cylinder and having a flat top portion lying upon the flanged head thereof forming a water space between said jacket and the outer wall of the cylinder, a cap having a water space therein and containing a combustion chamber, said cap also having a flat under face which rests upon that portion of the water jacket lying upon the flange of the cylinder head and forming a gasket between said parts, bolts passing through said cap and through the flanged head of the cylinder to clamp the gasket between said cap and flange, the flanged head of the cylinder, the interposed water jacket, and said cap having communicating openings to connect the water spaces of the cap and cylinder, the head of the cylinder and the cap having registering openings to connect the combustion chamber in the cap with the interior of the cylinder, said registering openings last mentioned being counterbored at the juncture of the cylinder head and cap, the gasket portion of the water jacket communicating with said counterbore, a stress ring lying in said counter-bore flush with the inner walls of said parts to close the joint between the cap and cylinder and relieve the gasket portion of the water jacket from strain, and means for detachably securing the lower end of the jacket to the cylinder wall.

5. In an explosive engine, the combination with a plurality of cylinders formed integral and spaced from one another, having a flanged head common to all of said cylinders and spaced from the ends thereof, a sheet-metal water jacket embracing the cylinders and common to all of them, said water jacket having a flanged top portion lying upon the flanged head of the cylinders and co-operating with said flanged head to form a water space at the ends of the cylinders and surrounding the same, said flanged head and top portion of the water jacket lying thereon being apertured to provide for openings communicating with the ends of the cylinders, an integral cap having a plurality of combustion chambers and a flat under face with a plurality of apertures therethrough communicating with said chambers, said cap supported upon the flanged head of the cylinders to confine the top portion of the water jacket between said parts in a manner to cause the apertures therein to register with the openings in the ends of the cylinders, said cap also having a water space therein, and the under face of said cap and the flanged head of the cylinders having registering openings to establish communication between the water spaces in said parts, and bolts passing through the cap and through the flanged head of the cylinders to clamp the top portion of the water jacket between said cap and head.

968,687. SPARK-PLUG. Herbert F. Provandie, Boston, Mass., assignor of one-half to The Randall-Faichney Company, Boston, Mass., a Corporation of Massachusetts. Filed May 18, 1909. Serial No. 496,735. (nine claims).

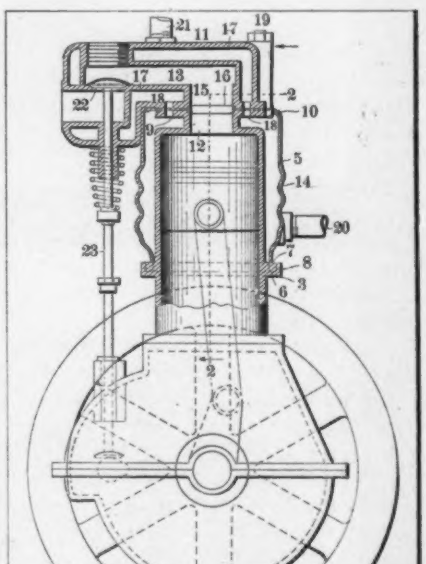


Spark-Plug

1. A spark-plug comprising a shell, a sleeve of insulating material within said shell, an electrode passing through said insulating sleeve and beyond the end of the shell, a head upon said sleeve extending beyond and over the end of the shell and having a recess or cavity containing the electrode end, a metal gasket between said head and the end of the shell, a bridge extending across the end of said head and connected at its ends with said gasket, and a complemental electrode attached to said bridge.

4. A spark plug comprising a shell, a sleeve of insulating material within said shell, an electrode passing through said insulating sleeve and beyond the end of the shell, said sleeve being extended beyond the end of the shell and having a shoulder overlapping the latter, and an electrode bridge crossing the end of the sleeve and having its ends bifurcated to form the halves of a divided ring or gasket and clamped between the said shoulder and the end of the shell.

5. An electrode bridge for spark plugs; a bar with forked ends made approximately as semi-circles.



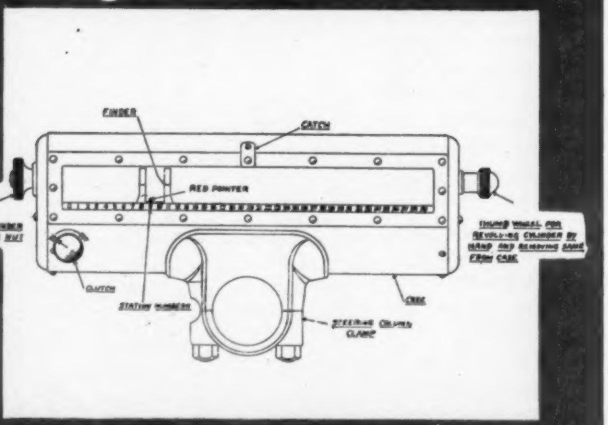
Water jacket for internal combustion engines

Mechanical Touring Guide

THE RHODES PATHFINDER, BASED UPON THE OFFICIAL AUTOMOBILE BLUE BOOK, SHOWS THE WAY BY DAY OR BY NIGHT


The Rhodes Pathfinder Complete


Showing Pathfinder and Cylinder



The Diagram of the Pathfinder

TOURING over unfamiliar roads, without explicit directions as to the course to be followed, detracts materially from the motorist's pleasure. Even the ordinary road-book, consulted under always unfavorable conditions of wind—and sometimes similar conditions of weather—and perhaps in the dark, does not provide the kind of guide that answers satisfactorily when most in demand. Just imagine how convenient it would be to have a native of the territory at the driver's side, giving ample warning of all approaching turns, danger points, exact mileage covered, and such interesting information as the tourists are constantly in need of! To all practical intents and purposes this is just what the Rhodes Pathfinder made by the J. B. Rhodes Co., Kalamazoo, Mich., does—a wonderful little device, contained in a cylinder six inches long and two in diameter!

Based upon the distances and information contained in the Automobile Blue Book, this little director of the movements of a touring party will perform even better than a flesh-and-blood guide—it is "on the job" all the time; never making a haphazard guess as to distances traveled or having its attention diverted by any of the thousand distractions inseparable from an automobile tour. By night or by day it automatically signals the driver, by means of a bell, to be on the lockout for the next turn or guide-mark, danger point or bit of bad going.

Before starting on a day's journey of, say, 150 miles or more—according to the number of directions in the Blue Book—the little instrument should be set for the route. The inner cylinder is removed from its case and the mileage and direction bands, which alternate thereon, arranged in proper order, each mileage band representing five miles and being divided into miles and tenths. Beginning with a direction band, the distance band is set exactly in line therewith, so as to indicate the distance of the first direction from the start. Then the next direction band, with its mating distance band, exactly set, is moved to its proper place on the cylinder, and so on. It takes but a comparatively short time to set the route for the coming day's trip, and replace the cylinder in the outer case, which may be attached either to the dash or on the steering column in easy eye-shot of the driver.

The Pathfinder can be attached to a car that is already equipped with a speedometer or odometer of any make in a very few minutes. Gearing, flexible shaft and full directions for attaching are furnished for cars not so equipped.

After being properly set and affixed to its place on the steering post the Pathfinder will signal the approach of each turn, the little red arrow on the finder pointing to the direction on the band and the mileage showing to the right. A turn of the small knob near the left end of the case throws the Pathfinder in and out of gear, so that side trips from the originally planned route may be taken, or in the event of an obstructed road ahead a detour may be taken and the route resumed farther on.

The key furnished with the instrument is an abbreviated form of the Official Automobile Blue Book, showing only necessary turns and mileages with the proper symbols corresponding to those on the cylinder rings. Many thousands of miles of road directions are thus condensed into a very small compass and the user is assured of every accuracy in view of the fact that all of the routes have been carefully checked by Blue Book cars.

Of course, side trips, optional routes, road descriptions, city and route maps, hotel and garage information and points of local and historic interest are left for the complete editions of the Blue Book, to which this instrument is destined to become ar almost indispensable adjunct.

General Utility Electric Motor

HANDY FOR POLISHING AND GRINDING IN THE GARAGE; LIGHTENS WORK OF MISTRESS AND MAID; VENTILATES HOUSE

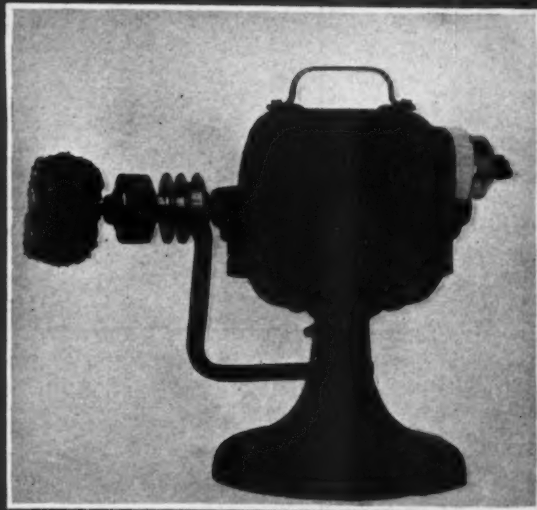
OWNERS of private garages and the "queen of the household"—in the plural number— will hail with delight the advent of the general utility motor now being placed upon the market by the Westinghouse Electric & Manufacturing Company. The numerous little jobs of grinding, buffing and polishing that bob up every day or two in the garage will be made easy of accomplishment through the medium of this compact little motor. The housewife's cares will be considerably lightened by it. It can be attached to the family sewing machine; geared up to a kitchen ventilating blower; it will turn a jeweler's lathe or other light machinery; operate moving window displays or mechanical toys—in short, the varieties of work to which it can be put are too manifold to enumerate.

As the motor takes but from 40 to 120 watts for its operation, it is essentially a day load. In any house fitted with electric lighting conveniences some sort of use can be found for it every day. All that is necessary is to unscrew a bulb and attach the plug to the motor. In the kitchen the polishing of silverware and cutlery will cease to be the *bête noir* of the maid; in the sewing room the mistress or her seamstress may be relieved of the labor of furnishing power for the sewing machine—a full set of attachments being provided by the company for every use to which it may be put. As a ventilating outfit it is especially serviceable. The small blower will remove the odor of cooking from the kitchen and supply fresh air, increase the draft of a furnace or freshen the air of a sick room; and by fitting the blower openings with suitable piping the air currents can be directed wherever desired.

These motors are made for operation on 115- and 230-volt direct-current circuits, and on 110- and 220-volt alternating circuits of 60 and 133 cycles. The direct-current motors are shunt-wound, while the alternating-current motors are of the induction type, single phase. The motors run at a speed of 1700 revolutions per minute. The motor is light and can be easily carried from place to place by means of a handle in the top of the frame. It is artistically finished in black enamel to harmonize with the other house decorations. The applications of the attachments are positive; it is impossible to put them on wrong.

In the ordinary small garage, where the means of storing gasoline are frequently crude in the extreme, the necessity of proper ventilation cannot be too strongly insisted upon. Careless handling of the liquid fuel cannot fail to result in the accumulation of gas, which needs only the lighted match of the smoker or an exposed gas or lamp flame to bring about an explosion. One of these little motors geared up to a small ventilationg blower—providing, of course, the garage is equipped with means of securing the necessary electric current—will clear the air of the dangerous gases in a very few minutes.

The private garage owner whose work-bench is provided with one of these motors will find numerous tasks for the sturdy little engine—running a small lathe; operating, grinding, buffing and polishing wheels for completing home-made repairs on his car, etc.



For Polishing and Grinding

Operating Ventilating Blower

Motor with Sewing Machine Attachments

To Prevent the Loss of Wheel Caps

There are two methods of ensuring that the wheel cap will not come off once properly put on: (1) If the cap screws up flush wth the meal ring of the hub a small center punch hole at the point of contact will prevent it coming unscrewed; (2) if the cap overlaps the ring, drill a hole in the ring and in the cap, tap out and place a small set screw that just comes flush with the cap. It will hardly be noticed, but may save trouble and expense later.

Prominent Automobile Accessories

A NEW ROTARY TIRE PUMP

The life of all tires is dependent upon the care with which correct pressures are

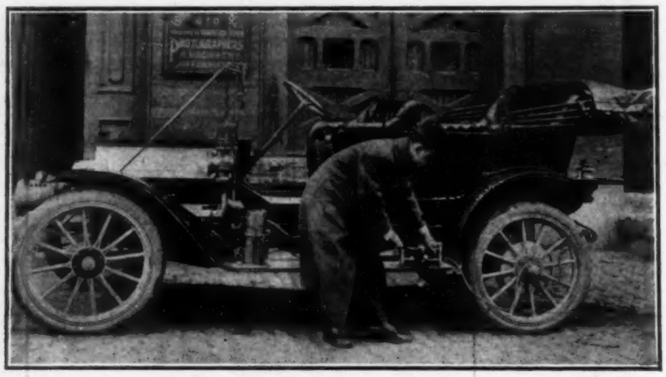


Fig. 1—Inflating a tire by means of the Haw-Man Pump

maintained. It will be found that the majority of people neglect this owing to the physical exertion required, whereas if the labor was reduced they would be more inclined to look after the pressure.

The accompanying illustrations show the Haw-Man pump recently placed on the market by the Hawthorne Manufacturing Company, of Bridgeport, Conn. It consists of a four-cylinder hand air inflator operated by a handle, the action of which is much less fatiguing than that of the up-and-down plunger variety. It can easily be attached to the running board, and as there is 6 feet of tubing, both rear and front tires can be inflated from the same position.

Fig. 1 shows the pump in position on the footboard, the operator being engaged in inflating the left rear tire. Fig. 2 gives a good idea of the appearance of the rotary pump and the method of its operation.

AUTOMATIC CLUTCH RELEASER FOR BUICKS

The F. B. automatic clutch releaser (Fig. 3), made by the F. B. Co., of Columbia, S. C., is a device to permit the Model 10 Buick being controlled entirely by the foot pedals, dispensing with the high-speed lever. It consists of a turn-buckle rod for interlocking the high-speed clutch and service brake of the high- and low-speed clutches. The method of fitting is very simple and when properly adjusted the device works well, as is shown by the number of testimonials the F. B. Company has received.

Quarter-inch holes are drilled in the low-speed and engine-brake levers as near the front of the lever as possible and about 1 1-4 inches below attachment of long coil spring. Rod 4 requires a little filing to accommodate loops 6, which are simply slipped over the yoke. The sheet-metal round lever 1 has to be cut away sufficiently to allow the two loops free movement.

A slight pressure on the brake pedal throws out the clutch and when the pressure is released the high engages. Heavy pressure on the brake pedal stops the car as when no releaser is used. Slight pressure on the low-speed pedal releases the high speed and operates the low, so that to come back to high all that is necessary is to release the low pedal.

The releaser never pulls the high-speed clutch out to the point where it locks, as does the regular equipment of the car, so that when the high is locked out by hand and the clutch releasers are in use the brake or low-speed clutch may be used independently.

Fig. 2—View of Haw-Man rotary tire pump

LONG- AND SHORT-DISTANCE SIGNAL

The tendency of the times is to reduce the number of accessories necessary to the satisfactory operation of the automobile. The necessity of carrying two warning signals—one for long-distance or emergency warning, another for short-range use—has long been looked upon with disfavor. With the introduction of the "Combination Klaxon," the Lovell-McConnell Manufacturing Company not only effectually meets this objection but provides an instrument (see Fig. 4) which is entirely unique among automobile accessories, and one which will appeal to the motorist.

This signal unites the regular Klaxon

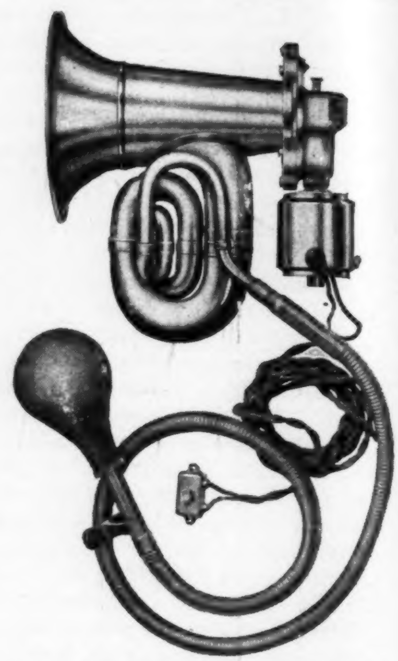


Fig. 4—The combination Klaxon horn

with a reed horn of finest workmanship and highest quality.

The ease by which either of the two signals may be operated is a distinct advantage. Button and bulb, side by side, enable the motorist to choose the signal he prefers to use, with the least possible distraction from the operating of the car.

WATERPROOF AUTO GARMENTS

With the approach of the inclement season the autoist will be interested in the announcement of the Rubbinol Raincoat Company, 1777 Broadway, New York, that it is prepared to furnish Rubbinol coats, capes, leg protectors, sleeve protectors, cap hoods, gloves, etc., and other garments designed to make winter driving less of a hardship, at its usual low rates.

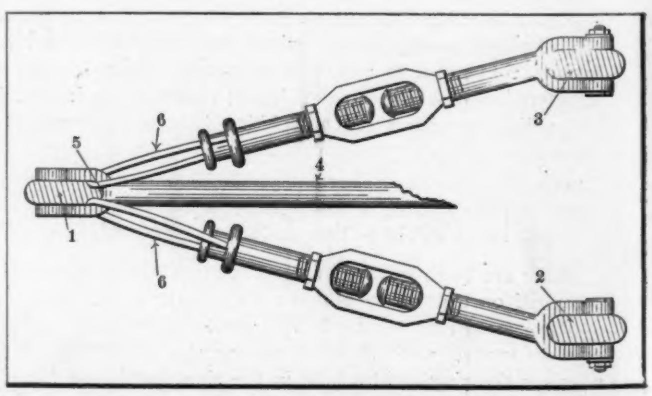


Fig. 3—The F. B. automatic clutch releaser